FEEDER VOLTAGE REGULATION

The ELECTRICAL REVIEW

FOUNDED 1872

VOL. CXII
No. 2884

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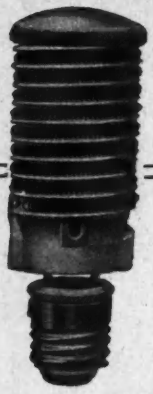

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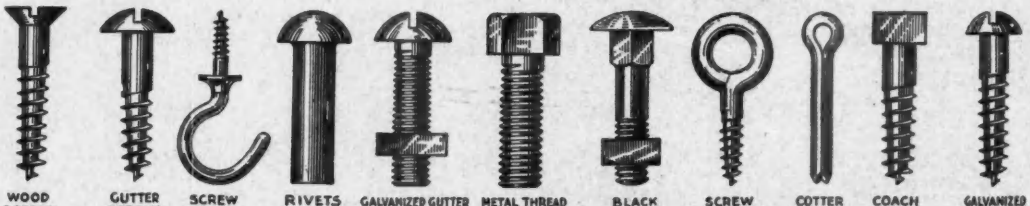

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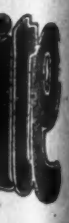

The
Electrical Review

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Collaboration With The Architects

THE necessity to electrical development of an understanding by electrical engineers and architects of each other's problems has only recently been fully recognised. Examples of this recognition may now be found in E.D.A.'s share in the Building Centre and in the interest displayed by architects in the course of lectures at the Lighting Service Bureau. In each case the two professions find common ground in a detailed application of electricity.

Interest in detail can be stimulated by an appreciation of general principles, and the lecture given by Sir Andrew Duncan to the Architectural Association—an old-established body that is modern in its outlook—was well calculated to stir the imagination of his audience. The presence of a number of leading electrical men also indicated the importance attached in our own industry of securing the assistance of the architects in working out our problems.

Sir Andrew happily emphasised an aspect that would appeal to architects when he referred to the grid as a form of national planning. As a matter of interest he mentioned that the saving in capital expenditure on generating plant that would not be required under the C.E.B. scheme would be enough to pay the entire cost of the grid within ten years—this apart from the saving in operating costs during that period.

Another claim was that the greater availability of supply would enable many rural areas to be developed from ten to fifteen years ahead of what would otherwise have been possible. That the grid will give flexibility to industrial development and enable factories to be built wherever manufacturers may choose is, we think, sufficiently obvious, but it was interesting to have Sir Andrew's considered opinion that in the grid we had a unique instrument to aid Britain in her efforts to regain industrial world leadership.

But the grid is only a foundation for a proper electricity supply, as was indicated in the subsequent discussion, and the increased consumption needed to ensure success will depend a great deal on the architects. The vast potentiality of this co-operation was illustrated by some comparisons drawn by Mr. H. T. Young between the consumptions of some West End stores, which have been only fairly well equipped with electrical appliances, and those of entire towns.

Collaboration is called for right in the early stages of building design, not only so that ducts and other electrical equipment can be properly arranged for many years ahead, but in order that fittings may be functional in type and harmonised with architectural plans. The present time is peculiarly opportune, as we are probably on the brink of great building developments, to take advantage of the prevailing low prices, not only for new houses and shopping premises, but also for industrial buildings, many of which sadly need reconstructing.

Well Done Birmingham!

THE Birmingham Corporation Electricity Department continues to make rapid progress. It affords an excellent example of the ability of an enterprising revenue-producing undertaking to make substantial additions to employment amongst its own ratepayers, and to provide a large volume of work for manufacturers, by increasing the consumption of electricity. During the month of January it connected up 1,163 new consumers. In three years the number of employés of the Department has increased by 530. Contractors have 650 men engaged on mains work, and expansion is proceeding at such a rate as to justify £550,000 capital outlay upon developments to meet increased demands. During the three years mentioned, 50,000 new consumers have come on to the mains, notwithstanding the industrial depression. The Electric Supply Committee recommends the Council to adopt a courageous policy and approve a new capital expenditure aggregating £750,000, £200,000 of which, as reported in our news pages, will be for the installation of electrical precipitators and new chimneys at Nechells and Hams

Hall power stations for dealing with the grit nuisance. This follows close on the report of the Taite Committee (our issue of December 23rd), which recommended the use of precipitators for pulverised-fuel installations and of chimneys of a height two and a half times that of the highest point of the power station buildings.

And Now Point Two-five

LAST week we referred to the pioneering work of the "Point Fives" in cheapening electricity and to the introduction of the halfpenny residential rate in Poplar in 1909. Now, just twenty-four years later, we record the coming of the domestic point two-five rate. A revised tariff is to take effect at Watford in the accounts for the present quarter which includes a farthing per kWh as a secondary charge of a two-part tariff in the summer quarters and 0.375d. in the winter. We have little doubt that Mr. A. W. Barham will find his bold move, backed by vigorous sales effort, to be fully justified. We hope the results achieved will set a new standard in tariff making.

Signs and the Times

THE (apparently) thousands of miles of neon tubing with which our shops and buildings are now decorated would convey the impression that, of a prosperous electrical industry, this was the most prosperous branch. Sad to relate, it is no more free from trouble than any other branch—particularly in the matter of price-cutting. At the annual conference of the Master Sign Makers' Association last week the subject was dealt with by Mr. E. J. Shuter, who maintained that orders had been accepted at any price in order to secure business regardless of ultimate results. He implied that low quotations could not possibly include the service which was necessary to the business. He was optimistic enough to think that the newly formed Electrical Section of the Association would be able to procure better trading conditions, but showed that his faith in its ability to do this was not unshakable by going on to suggest that a body on the lines of E.L.M.A. might also be formed to deal with price-cutting. We wish the sign makers well, but we fear that their other efforts—standardisation and formulation of requirements—will meet with greater success than attempts to control prices.

"Still Going Strong"

THE first Peebles-La Cour motor-convertors to be installed by a London borough were put in at the Edward's Lane sub-station, Stoke Newington, in 1906. They are still fit for the duty for which they were designed, and Mr. Hedley Large, borough electrical engineer, has thought it well worth while to give them and their accompanying Ferranti transformers a new lease of life at the new sub-station which was put into commission last Saturday. This is a tribute to Messrs. Bruce Peebles, the manufacturers, and is in accordance with the best traditions of British production.

Protection Against What?

A WEEKLY contemporary announces the formation of an "Electricity Consumers' Protection Society," and the high prices charged for power, heating, and cooking in some areas would appear to justify the existence of such a body. But seemingly it is the view of those behind the Society that consumers require to be protected against the London and Home Counties Joint Electricity Authority, which has reduced and standardised prices for electricity and apparatus in the areas that it has acquired. It is feared that the Authority may persuade municipalities to transfer their rights to purchase, some years hence, company undertakings or those portions of them that lie within their boundaries, and so prevent their being operated as units even smaller than those prevalent now! Consumers could not hope to benefit by the breaking up of the existing supply areas, and a larger body, such as the J.E.A., on which the companies are represented, should be better able to appreciate whether the records of the present companies indicate their fitness to continue in possession after the expiry of the period for which they have been granted statutory powers.

Keep it in the Family

FROM gas sources we learn that there are seven makers of electrical apparatus in Birmingham who between them consume 148 million cub. ft. of gas per annum. Most of this is, we believe, used for the heat treatment of metals. In view of the success obtained by the Corporation in developing the industrial heating load in non-electrical works it seems strange that some fifteen million kWh (having due regard to the greater efficiency of electric furnaces) should be lost to electricity supply in this way. There are similar examples in other parts of the country where the furnaces were installed before electric furnaces had reached their present high stage of development and in the days before the supply undertakings had seriously tackled the load at low rates. The loss of output due to non-support of electrical methods entails also a loss of business to manufacturers of plant of all kinds. These should be the first to back up the work of the supply undertakings, which is creating a market for their goods.

Our Trade with Finland

IN Finland there is a real desire to stimulate the demand for British goods, according to a statement made on Tuesday by Sir Alan Anderson, K.B.E., chairman of the United Kingdom Trade Mission which recently visited the country. The people wished to buy from us to compensate us for the large quantities of goods bought from them. They have suggested a shopping week for British goods in Finland towards the end of the summer. Thirty Finnish trade representatives came over to the British Industries Fair with this in view, and, in co-operation with the Department of Overseas Trade, they are looking for goods suitable for special shop-window displays if British firms fall in with the scheme. It will be remembered that the Mission included representatives nominated by our trade associations, the delegate from the electrical industry being Mr. Allen West. It is unlikely that any official report of the Mission's work will be issued, as tariff negotiations with Finland are imminent. Lt.-Col. J. Colville, Secretary of the D.O.T., recalled the fact that tariff negotiations with Denmark, Norway, Sweden, and Iceland were in progress, which, together with the negotiations with Finland, should result in an improved market for British goods in this part of Europe.

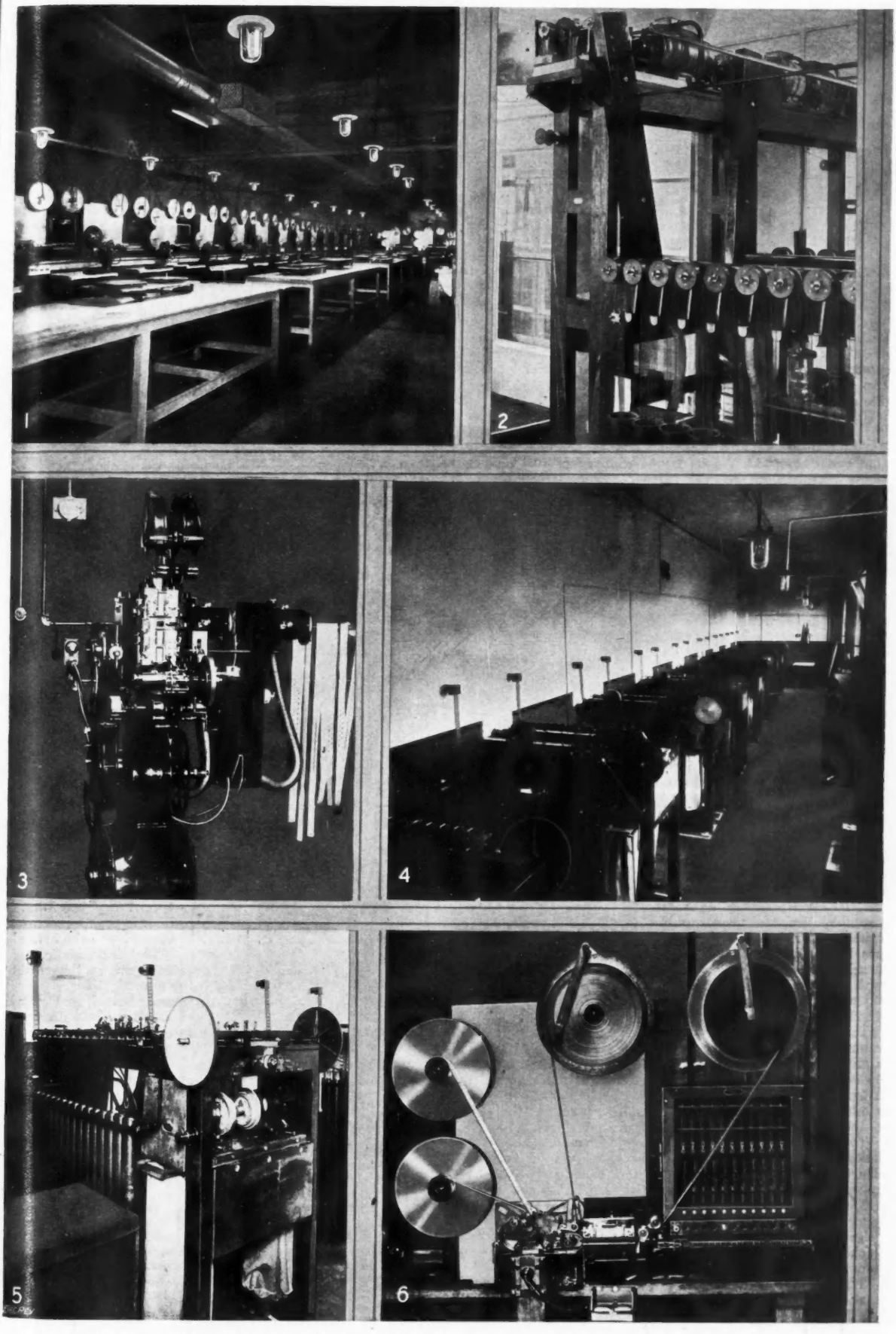
The Sales Development Movement.

IN the course of his reply to Mr. J. W. Simpson (I.M.E.A.), Brig.-Gen. Legge writes with knowledge and conviction of the handicap under which E.D.A. stands through lack of financial support. We cannot imagine that Mr. Simpson was serious when he said: "Surely E.D.A. is fully capable of undertaking all the propaganda work necessary to secure the development of electricity." The need for the organisation to have its income doubled or trebled has been stressed for years past. The great work that it has tried to do, and the results achieved, are small compared to the opportunity that exists all over the country for intensive propaganda and kindred activities. The suggestion for a Sales Development Association deserves serious consideration. We look to the Central Board to give a strong lead, and we do not think we shall be disappointed.

It Isn't Done

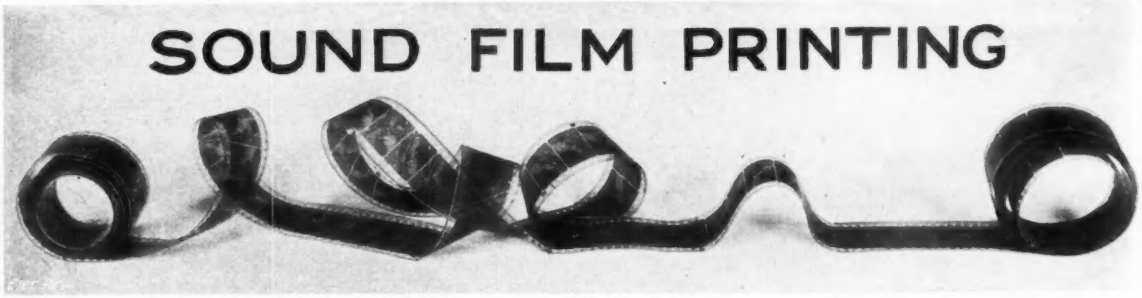
AN Irish paper reporting a fire at the R.I.Y.C. premises states that "it is believed that the fire was caused by an escape of gas." It may be that no electric wires were on the premises, but their absence would not have deterred some of the English papers from ascribing the fire to a "short-circuit," as has been done in such cases. But is not the Irish version of the formula a glaring contravention of the rules of the game?

At the Gaumont-British Film Laboratories



1. A view of the automatic film-printing machines. 2. The driving motors of the negative printing plant. 3. An electrically driven printing machine. 4. A battery of film dryers. 5. The motor drive of a drying machine. 6. An electromagnetically controlled automatic printer. (Description on page 300)

SOUND FILM PRINTING



THE making of talking cinematograph pictures is an extraordinarily fascinating business. Seldom can the average picturegoer have any real conception of the care, patience, and ingenuity that need to be exercised in the production of a film. This is one example of a great industry which has been built up by the aid of electricity in its diverse applications. Most of the arts and sciences are employed in studio production, besides which extensive laboratories are employed for the treatment of film after exposure in the studio cameras, which are themselves electrically driven and make two records photographically, one pictorial and the other electro-acoustic.

The Shepherd's Bush laboratories of the Gaumont-British Picture Corporation, Ltd., at present serve five sound-proofed studios with a floor area exceeding two acres, and a sixth is now being equipped. Their output capacity of two million feet of finished film per week is made possible largely by the use of automatic machinery, designed by Mr. W. H. Hitchcock, manager of the laboratories, which was so adaptable that three days sufficed to change over the plant when it was called upon suddenly to make talking films.

The negative films are developed by passing them down and up long vertical tubes (fig. 2, p. 299), containing the necessary chemicals and later washing water before they enter the glass drying cabinets through which warm filtered air is circulated. There are three units in this plant, each driven by a ¼-h.p. G.E.C. single-phase motor through Keenock gears which vary the standard speed of 40 ft. per min. from 6 to 60 ft. per min.

Automatic Processes

Prints made from the negatives are similarly treated in seventeen rows of automatic motor-driven machines (fig. 1). The film first passes through a vacuum nozzle which removes adhering dust particles. It then goes through vertical tubes 25 ft. in length containing the developer, washing water, fixing solution, and more washing water. After the surplus moisture has been removed by a suction nozzle, the film passes through the wall to an adjoining room in which it is fed through more pipes up which warm filtered air is circulated for drying the film (figs. 4 and 5).

The Gaumont-British studios at Shepherd's Bush

This was the first big automatic plant of its kind in this country. It was supplied by the Lawley Apparatus Co., Ltd., and develops film at an average rate of 35 ft. per minute or 60 ft. per minute maximum. Three men only are needed to attend to the machinery, whereas the old rack-and-drum method would have required twenty-four men for the same output.

The 25-ft. long tubes pass through two floors to the basement below, where drying air is blown up them by thirty-four Sturtevant fans driven by Crypto ¼-h.p. motors. The developing solution is circulated by two G.E.C. ¼-h.p. motor pumps (200 V, single-phase), the requisite temperatures being maintained by thermostatic control tanks (steam heated and refrigerated) which react to half a degree change of conditions (Johnson Service Co., U.S.A.), while an electric thermometer provides visual and audible warnings of abnormal variations.

The "release" printing room works at high speed, automatically printing films off the original for distribution to the projection theatres. The twenty-two machines (fig. 1) are all linked together by a common driving shaft with simple clutch engagement, so that each can work independently or in combination with the next machine. As the raw "stock" (film strip) moves through the first machine it prints the pictures on it, leaving a narrow margin on one edge upon which the second machine prints the sound track. This method is known as parallel printing, but for news reels an even quicker system is used and by series printing as many as twenty-two prints can be made simultaneously.

Maintaining Uniform Density

The ordinary commercial printing machine, motor driven with electrical make-and-break sequence control of electromagnetic clutches, is an elaborate piece of mechanism; the machines designed by Mr. W. H. Hitchcock at Lime Grove are much simpler, quieter, and less costly. Scenes and sequences photographed at different times in varying degrees of light need to be brought to a common level. Visual examination of the negative after development reveals differing density which requires changing printing intensity. Small metal clips are accordingly attached to the sprocket holes on the edges of the film at appropriate intervals; they are easily attached and detached by a small hand press.

As the negative passes through the printing machine (fig. 6) uniform density of the positive is achieved by varying the light beam emitted by an incandescent lamp. This is done by inserting in and withdrawing from the lamp circuit a series of resistances actuated by Lawley electromagnetic relays, which are energised in appropriate sequence from a flat commutator with the segments of which the metal clips on the film make contact. A very steady light is necessary for printing; these incandescent lamps therefore have a separate 110-V circuit fed from a Tungstone battery of sixty-one cells.

Lighting and Air Conditioning

All wiring is enclosed in screwed steel conduit and stout well-glass lighting fittings are used to avoid bare filament exposure should a lamp bulb be broken. In the dark rooms actinic light is excluded by the use of special well-glass fittings which emit eerie orange-red rays, while the atmosphere is humidified to prevent the accumulation of frictional static charges that might cause sparks which would "fog" the films.

The ventilating air is of course filtered, heated, and cooled according to requirements. The Hall and Kay air-conditioning plant and Haslam & Newton refrigerator are driven by Brittain motors with Watford and M.E.M. control gear, temperature control being on the "Teddington" system of the British Thermostat Co., Ltd., while the vacuum plant is driven by a Crypto motor.

Electricity Supply in South Africa

The constitution and work of the Electricity Supply Commission of South Africa were outlined in a paper which was read recently before the S.A. Association for the Advancement of Science at Durban by Mr. A. M. Jacobs (Commissioner, Engineering). Mr. Jacobs said that the Commission's satisfactory financial position had been achieved in spite of the fact that without exception its consumers were paying lower prices for electricity than they originally contracted for or expected to pay, and in spite of reductions in the initial tariff. Rapid extension of the number of electrical plants in the Union had followed the creation of the Commission in 1922. The then total of ninety had been increased to 188. Several important schemes were held up on account of the difficulty of raising capital, but notwithstanding the adverse economic conditions wherever unrestricted supplies were available the increase of consumption for domestic purposes had been remarkable during the last two years.

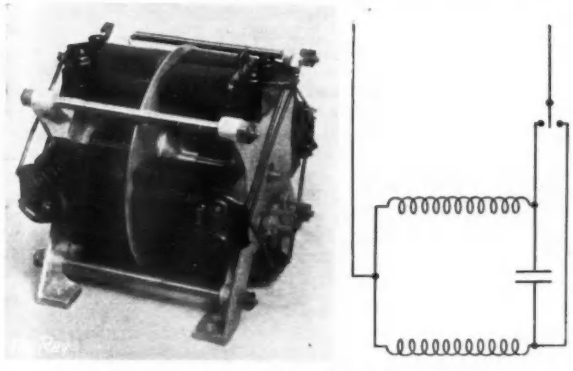
Feeder-voltage Regulation

Characteristics of the moving-coil regulator

By E. T. NORRIS, M.I.E.E.

AS a general rule, it is only in problems involving interconnection, tie-lines between power stations, or parallel operation that voltage phase displacement is of importance. In ordinary distribution circuits, it usually does not matter whether or no there is any phase displacement. Phase displacement is the angle between the incoming and outgoing voltages; it is independent of load and usually due either to internal connections or to the inherent characteristics of the apparatus. Ordinary transformers connected delta/star, for example, have a voltage phase displacement of 30 deg.; a three-phase induction regulator for ±10 per cent. voltage variation has a displacement of 6 deg. in the neutral position.

Neither single-phase nor three-phase moving-coil regulators



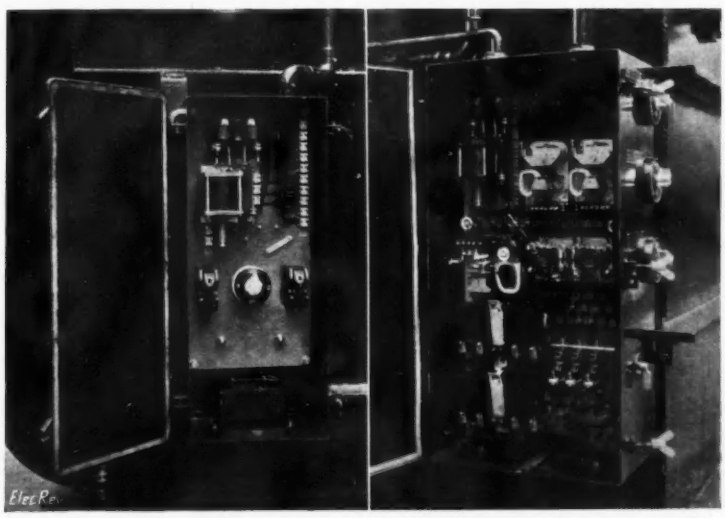
The induction disc motor and its connections

have any voltage phase displacement in any regulator position. In this respect they are similar to single-phase induction regulators, and to twin three-phase induction regulators, but ordinary three-phase induction regulators have a voltage phase displacement depending upon the position of the regulator and independent of the load.

Moving-coil regulators or regulated feeders can be operated in parallel with each other or with adjacent unregulated feeders. Simultaneous operation is ensured by coupling the regulators mechanically where possible, and alternatively, by electrical control. The regulators must, like ordinary transformers connected in parallel, have appropriate internal impedance values. In special cases of parallel operation for tie-lines or interconnection purposes short-circuited compensating coils can be provided to give negligible impedances or controlled values over the regulator range.

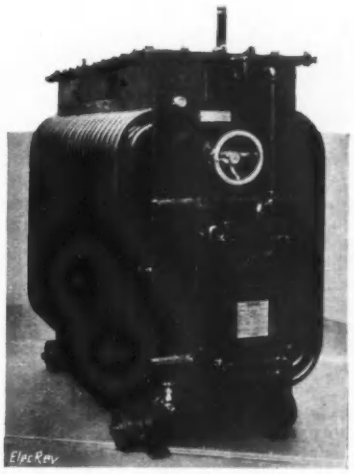
Automatic Operation

From the operating engineer's point of view, an outstanding feature of the new regulator is the simplicity of the automatic control gear. The apparatus ordinarily employed includes the following elements:—(1) A single-phase or three-phase motor, usually of the induction type. Such motors, when built in small sizes, run at a high speed, *e.g.*, 3,000 r.p.m., for a two-pole, 50-cycle motor, have a relatively small starting torque, and take a starting current many times the normal full-load value. The high speed necessitates reduction gearing to get down to the very slow motion of the regulator; to minimise expense, the regulator is designed to operate relatively quickly.



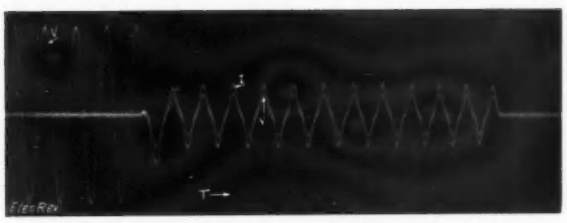
Left: Control panel for an automatic moving-coil regulator. Right: Automatic control panel for on-load tap changing

As a result of these characteristics the automatic control gear comprises:—(2) A voltage relay or contact-making voltmeter to initiate operation of the regulator in the correct direction; such relays are usually set to operate whenever the voltage varies ±1 per cent. or more from the set value. (3) A mechanical brake, usually automatically operated, to stop the motor immediately it is switched off, and prevent over-run, which would otherwise cause excessive voltage change and set up hunting. (4) Time delay relays to prevent operation on sudden and momentary changes in voltage. (5) Starting contactors for controlling the motor. (6) Auxiliary relays to step down the contactor current to a value sufficiently small for the voltage relay or contact making voltmeter. (7) Limit switches which automatically switch off the motor when it reaches the extreme end of its travel in either direction. If the motor were not thus disconnected it would stall and be burned out by the resulting short-circuit current.



A 50-kVA, 440-V, three-phase, fully automatic regulator

The simplification of this gear in the moving-coil voltage regulator is primarily due to the very low mechanical power required to operate it. The driving element, an induction-disc split-phase motor, consists of two iron-cored coils mounted on either side of a copper disc forming the rotor. A condenser is connected in series with one of the coils, and the flux interactions in the rotor provide the driving torque. From one to four of these driving elements are employed, giving four output



Oscillogram of short-circuit tests on m.-c. regulator

ratings. A single two-way switch controls both starting and stopping and direction of rotation.

The characteristics of this type of motor are:—(a) It can be designed to run at 150 r.p.m. or less, instead of 3,000 r.p.m. (b) Its starting torque is much greater than the running torque. (c) It takes no more current at starting than when running under full load, *i.e.*, it is impossible to overload it electrically. It can, therefore, be stalled without any risk of damage. (d) Both when starting and running, the current taken is at approximately unity power factor. The wear on contactors in making and breaking this current is much less than for the low power factors of other types of motors. (e) There are neither commutators, slip rings, brushes, nor moving windings even for starting.

Simplified Construction

As a result of these motor characteristics, the following simplifications in automatic operation are possible:—(i) Due to the slow motor speed (a), relatively little mechanical gearing is required. (ii) For the same reason, an automatic brake is unnecessary, as the over-

run is negligible. (iii) Also due to (a), the speed of operation of the regulator can be much lower, so that momentary voltage variations are too short in duration to cause appreciable response from the regulator; no time delay relays are, therefore, required. (iv) Due to (b), (c), and (d) the starting current is very low and a small single-phase mercury switch can be used for starting the motor instead of open contactors. This switch takes no more power to operate than the auxiliary relays described above, so that the latter are now unnecessary. The voltage relay or contact-making voltmeter operates directly on the mercury switch controlling the motor. (v) Due to (c) the motor can be allowed to stop of its own accord when it reaches the end of its travel, without damage, and limit switches are unnecessary. (vi) Due to (c), no overload tripping mechanism is necessary in the motor circuit. (vii) Since no time delay is required, the regulator commences operation immediately voltage conditions demand it. It is usual to set time-delay relays for 60 to 120 seconds delay, so that the regulator makes no attempt to operate until this time has elapsed. Operating experience indicates that the moving coil regulator is noticeably quick acting in service. (viii) Due to the low speed and simple construction of the motor it can be operated under oil, and thereby protected from damage and atmospheric conditions.

The voltage relay operates directly on two small mercury switches in the motor circuit. These switches are immersed in the regulator tank close to the motor itself, and need no attention. They are controlled by two simple solenoids and take no more power to operate than the auxiliary relays. The switch controls the automatic operation. With this switch in the " off " position, the control panel is " dead " and adjustments to the relay setting, &c., can be made with the regulator still in service.

The moving-coil regulator is similar in operation to the ordinary induction regulator in so far as it varies the voltage uniformly and not in steps, and can be left in any position. It is distinctive in that the mechanical forces are very small and the moving parts are entirely isolated electrically, involving neither flexible leads, sliding contacts, nor slip rings. Moreover, it has the design characteristics of the ordinary transformer rather than of the induction regulator; it can be designed for high voltages and heavy currents, and can be economically built in very small sizes. The limitation is not the cost of the regulator itself, but the cost of the mechanical operation and automatic control gear.

A Summary of Advantages

The combination of the regulator with a main step-up or step-down transformer permits considerable saving in space and cost. The transformer price is increased very slightly due to the tapping, whilst the regulator is appreciably cheaper due to the absence of boosting and bucking coils. In comparison with on-load tap changing methods of voltage regulation, the moving-coil regulator usually takes up more space and involves load and no-load losses, whereas the increase in transformer losses due to on-load tap changing is usually small. On the other hand, the regulator is suitable for an unlimited number of operations, as it is free from switches or contactors which are likely to wear and give trouble.

From the operating point of view an important characteristic is the absence of noise and vibration. Since there are no small magnetic air gaps, and the mechanical forces are very low, chattering and wear of bearings are negligible, and increase in noise and vibration, often experienced after a few months' service, is avoided. The main magnetic path of the moving coil regulator is mostly air, and the iron serves chiefly as a surrounding yoke or container to form a return path for the magnetic flux and to control its direction. Moreover, the flux density in the core iron is very much lower than in ordinary transformers.

Not an Attack

Brig.-Gen. Legge on the need for a new Association

MR. J. W. SIMPSON, in the exercise of his authority in the important post he holds, seems to think, in his obviously sincere article appearing in your issue of February 24th, that he is called upon to defend the fortress of the undertakings he represents. I was unaware, however, that I had ventured to attack such an impregnable stronghold. There was certainly nothing in my extremely mild and temperate suggestions in the ELECTRICAL REVIEW of February 3rd, which could possibly be construed as a reflection upon the municipal undertakings as a whole in any way; everyone knows that amongst these are to be found up-to-date and enterprising undertakings.

No useful purpose is served, by entering into any controversy on such a subject. Each one of us who has the interests of the industry at heart should wish to do all in his power to increase, very considerably, the number of units used per head of population and thereby place this country in a position superior, from an electrical standpoint, to that which it now holds as compared with other countries. The grid scheme gives us the solid foundation to work upon and the question is how are we going to use that foundation to build up a position second to none?

The object of my article was to point out that there *are* backward undertakings—company and municipal—the immediate and vigorous stimulation of which is essential. There are, unfortunately, a number of supply undertakings, that may be termed " chronic invalids " who imagine, to put it mildly, that they are inflicted with a malady which renders them unable to rise from their beds of apathy and indifference. We all know there have been effective cures in such cases, by the administration, naturally or artificially, of a sudden shock which has succeeded in making such invalids jump from their beds, lose their lethargy and run like deer. The question arises then, who is to administer such stimulation and what form is it to take?

Where Is Our Salesmanship?

Whilst every credit should be given to the British electrical engineer for the part he has played and is playing in sales development, it must be remembered that no productive business can be run efficiently, increasing substantially its annual turnover, unless it possesses an up-to-date and energetic sales organisation. Can we whole-heartedly affirm that the average level of the entire supply industry's sales effort does not suffer by comparison with such other, and less important, commercial enterprises as automobiles, tobacco and patent medicines? I should say we cannot.

I feel sure that anyone interested would obtain a valuable outside conception of the situation by asking various members of the public who have a supply of electricity in their homes or business premises, the following questions:—

(a) Were you persuaded to become a consumer by the local undertaking?

(b) Have you ever been approached by personal contact or even by direct mail subsequently with a view to your increasing your consumption of electricity, *i.e.*, using more apparatus, &c.?

(c) Have you been persuaded to visit your local electrical showroom, and in doing so did you find the same degree of good salesmanship as obtains in the big stores?

My own experience in this respect has been the reverse of encouraging.

A Sales Development Association

Mr. Simpson criticised my suggestion of a Sales Development Association on the grounds that: (a) It would be useless until electricity prices are fixed by a common formula; (b) E.D.A. is capable of undertaking all necessary propaganda work; and (c) the addition of yet another organisation is undesirable.

With regard to (a) although the question of price, or rather of price reduction, is of paramount importance, it certainly does not govern the sales situation, as an examination of methods adopted and results obtained by, say, the high-priced vacuum-cleaner companies will reveal. Concerning (b), lack of financial support by the industry at present completely hampers the activities of E.D.A. My work with that body has so impressed me with its possibilities as to suggest that the Central Electricity Board might with advantage consider the provision of financial assistance to enable E.D.A. to realise these possibilities. With respect to (c) a new organisation is always valuable if it is needed and is competent to fulfil its object. No new organisation was suggested by me, however. The Sales Development Association was mentioned as a thing desirable as a component part of an existing organisation, *i.e.*, the Central Electricity Board or E.D.A. By means of a competent and tactful personnel, such an association would promote a higher standard of salesmanship with corresponding benefit to the industry.

Finally, I agree with Mr. Simpson that co-operation in all sections of the industry and the sinking of self for the benefit of all, is essential to sound development, otherwise a situation arises where there is a misdirection, and therefore waste, of energy which could be better and more profitably employed in gathering in the plentiful harvest lying at our feet.

R. F. LEGGE.

Some Municipal Electrical Engineers

From left to right: Mr. A. E. McKenzie, Wimbledon; Mr. C. S. Davidson, Barnes; Mr. E. A. Anderson, Walton-on-Thames (*Elliott & Fry*); and Mr. S. H. Fowles, Heston and Isleworth

Reactive Current. By G. W. Stubbings, B.Sc., A.M.I.E.E.

Two distinct definitions

IT is customary, in an elementary exposition of the theory of the transformer, to show on a vector diagram the exciting or open-circuit current resolved into two components, the one, in phase with the applied voltage, being called the core-loss component, and the other, in quadrature with the voltage, being called the magnetising component. Of these three quantities, the actual open-circuit current can be directly measured as virtual amperes, and the core-loss current is obtained by dividing the open circuit watts by the voltage. The third component, the magnetising current, is obtained as the square root of the difference of the squares of the actual open circuit current and the core-loss component. If these three quantities are combined in a vector diagram a definite angle of phase difference between the open circuit current and the voltage is indicated.

If both the voltage and the open-circuit current of the transformer were sinusoidal in wave form it would be possible to measure the magnetising current by means of a reactive meter, in which this current is virtually associated with a voltage in quadrature with that actually applied to the transformer. Actually the open circuit current wave contains a considerable proportion of third harmonic if the applied voltage wave form is sine shaped. Since any wattmeter which is excited by a voltage whose wave form is sine shaped will ignore harmonics, the magnetising component of the open circuit current of a transformer will not be the same if measured by means of a reactive meter as if it is calculated as the square root of the difference of the squares of the actual current and the core-loss component. In other words, the sum of the squares of the core-loss current and the magnetising current as measured by means of a reactive meter will give, not the virtual value of the open-circuit current, but the virtual value of the fundamental of this current. Moreover, the power factor of the actual current, as calculated from the measured value of this current and the core-loss component, will not be the same as that given by a power-factor meter in which the reactive component, as given by a wattmeter, is associated with the active component.

British and American Definitions

These considerations show that there are two distinct ways of defining reactive current, which, although they lead to identical results when the wave forms of both current and voltage are sine shaped, are not the same when a sine wave of voltage is associated with a distorted current wave. The Standardisation Rules of the American Institute of Electrical Engineers explicitly define the reactive component of the current as being equal to the square root of the difference of the squares of the current and the active component of the current, the active component, of course, being the quotient of the watts by the voltage.

The definitions in the British Standard Glossary of Terms used in Electrical Engineering are not so clear. In this glossary the active current is defined as the component of an alternating current (regarded as a vector quantity) which is in phase with the voltage, while the reactive component is defined as the component of the current (regarded as a vector quantity) which is in quadrature with the voltage. The qualification, "regarded as a vector quantity," is ambiguous. In the case of the active component, the nature of which is not ambiguous, the association of the current and voltage in a wattmeter is clearly implied as the basis of the measurement and, by parity of reasoning, it appears that the basis of the measurement of the reactive current will be the association of the actual current and voltage in some form of reactive meter. There thus appears to be a difference between the British and the American definitions of reactive component of an alternating current.

The nature of this difference can be illustrated by considering the association of a sinusoidal voltage whose virtual value is V with a non-sinusoidal current whose virtual value is $I\sqrt{(1+n_3^2 - - -)}$ where n_3 is the ratio of the amplitude of the third harmonic to that of the fundamental. The power arising from this association will be VI cos ϕ where ϕ is the phase difference of the voltage and the fundamental in the current wave. The American definition leads to a value of the reactive component which is equal to $I\sqrt{(\sin^2\phi+n_3^2 - - -)}$, while the value implied in the British definition and which would be given by a reactive meter is simply I sin ϕ. The ratio of the reactive to the active components, according to the American definition, can be regarded conventionally as the tangent of an angle; the cosine of this angle is the actual power factor which, with a sinusoidal voltage, can never be unity with a distorted wave of current. The ratio of the reactive to the active component, according to the implied British definition, is tan ϕ, ϕ being the actual phase difference between the sinusoidal voltage and the fundamental of the current wave.

How the Different Methods Work Out

By way of a numerical example we may consider a current consisting of a fundamental whose virtual value is 10 A with a 30 per cent. third harmonic. The actual virtual value is 10.45 A. The maximum value of the power factor with a sinusoidal voltage will be 0.955, and when this condition obtains the reactive component, according to the American definition will be 3 A, but zero according to the implied British definition. If the fundamental of the current lags 60 degrees on the sinusoidal voltage the reactive component will, according to the American definition, be 9.15 A and the ratio of this component to the active component of 5 A will be 1.83, this being the tangent of an angle of 61.5 degrees approx. It should be pointed out that the angle whose cosine is the ratio of active component to actual current is not necessarily representative of the phase difference between a current having a distorted wave and a sinusoidal voltage.

The American definition has the advantage of being quite explicit in its application to all circumstances. It is also rational in that, since the harmonics in a current associated with a sinusoidal voltage can carry no power, these harmonics are in a literal sense wattless, and should be included in the specification of the wattless component of an alternating current. The definition has the disadvantage that the quantity that it defines cannot generally be measured directly. The quantity which seems to be implied in the British definition is capable of direct measurement in all conditions, but it is misleading in that it appears also to imply a value of the power factor which is the cosine of the phase difference between the fundamental in the current wave and the voltage, instead of the ratio of watts to volt-amperes.

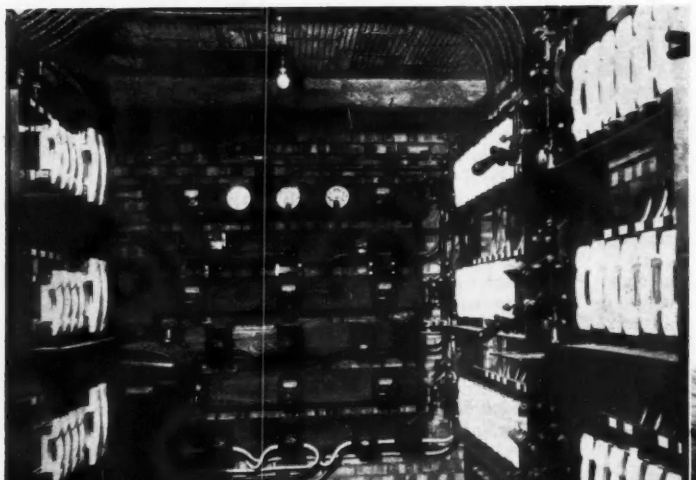
Brettenham House

Electrical equipment in one of London's latest buildings

BRETTENHAM House and the Duchy of Lancaster Building have been erected near the Institution of Electrical Engineers, Victoria Embankment, W.C., for the Law Land Company. The supply mains are looped in from the 10.5-kV ring mains of the Charing Cross Electricity Supply Co., Ltd.; the high-voltage feeders are controlled by Reyrolle ring-main switches, and the current is transformed by two 500-kVA Bruce-Peebles transformers. The 230/400-V side of the transformers is also connected to the supply company's ring main distributors through Statter switches. A further emergency service supplying a few corridor lights on each floor is taken from the d.c. distributors of the Metropolitan Electric Supply Co., Ltd.

The space available for the switchgear was very limited, and fuse-gear, of the B.I.C. street-pillar type, was installed. Separate panels are provided for light, heating, and power; each light and heating panel is protected by three s.p. Record breakers and each power panel by a three-phase Ellison breaker. The main distributors are four-core, p.i., l.c., and single-wire-armoured, of British Insulated Cables "drained" type; although the runs are vertical, with a rise in many cases of 120 ft., no sealing boxes are employed in the intake room and there is no trace of "bleeding." These paper cables terminate on each third floor at Walsall Conduit distribution boards, designed to accommodate tenants' sub meters.

The building has no party walls and the electric wiring was arranged as to be readily available at any point without surface wiring. A circuit was run from a separate way on each distribution board to four ceiling boxes in line with each window and thence to a switch-plug mounted below the window; pairs of wires were drawn through this run without a break, a bight of about 4 in. being left at each box. As the boxes are mounted an inch above the finished face of the ceiling, extensions can readily be made to other positions by attaching a special side entry extension collar and chasing the plaster. The whole of the wiring on each floor is on the same phase, and all sub-distribution wiring has been coloured in accordance with the scheme recommended in the I.E.E. Regulations. The v.i.r. wires are of Pirelli-General manufacture. The sectional areas of distributors and sub-distributors have been calculated for a maximum illumination of 15 ft.-candles.



A main distribution room, showing power breaker and fuses on left, lighting and heating panels on right, and metering panel in centre

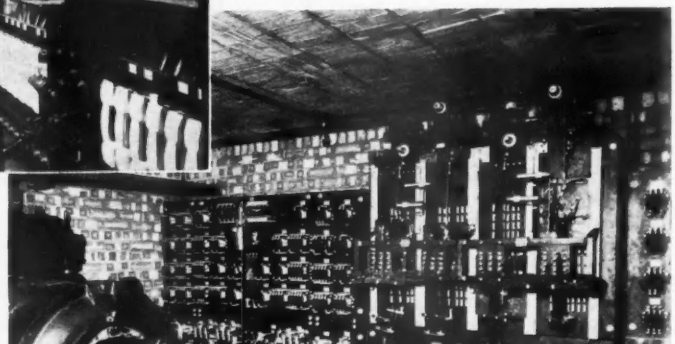
There are four main passenger lifts and two goods lifts, manufactured and installed by Messrs. Smith, Major & Stevens and the Express Lift Co., Ltd. The passenger lifts, which are claimed to be the highest speed lifts in Europe, are designed for a working load of 2,240 lb. with a maximum running speed of 700 ft.p.m., and are operated by shunt-wound d.c. 80-r.p.m. gearless motors. The machines are situated at the bottom of the building and the driving sheaves with their vee grooves and large brakes are mounted on the armature. Each motor is supplied from a generator consisting of an a.c. motor, a main generator with a series winding and a demagnetising winding, and a constant-voltage exciter.

The controller is operated entirely by d.c. magnets fed from the exciter. It carries the switches for reversing and for progressively increasing and decreasing the voltage applied to the gearless motor. A main switch in the main circuit between the generator and the gearless motor prevents creepage due to circulating current. Normally this switch is opened about a second after the lift has stopped; it breaks a very small current due to the action of the demagnetising field. Should the operator wish to make a sudden stop this switch is dropped and completely disconnects the gearless motor, applies a powerful dynamic brake action, and in conjunction with other switches in series de-energises the brake magnet, thus applying the brake to the machine. The changes in speed are inherently smooth as they depend on variations in the magnetic field of the generator which lag behind the changes in resistance that produce them.

To ensure that the initial start and final slowing are free from surges, a small motor-driven rheostat with a large number of stops regulates the field changes at these points. Safety devices include a smooth acting gear to prevent overspeed and long-stroke hydraulic buffers under both cap and counterweight.

The duplicate goods lifts are equipped with three-phase variable-speed commutator motors, directly connected to the supply.

Battery-driven electric clocks have been installed by the Magneta Time Co., Ltd., throughout the building; their number will ultimately be between 800 and 1,000. The secondary clocks are actuated by a master clock with a half-seconds pendulum, current being supplied by a Latimer-Clark cell, the life of which is claimed to be approximately three years with an even output over the whole of its life.



Motor-generator and controller for a passenger lift

The building was designed by Messrs. William and Edward Hunt. The electrical installation was designed by Messrs. Murray Coombs and Richards, and carried out by Engineering Works (Electrical & General), Ltd.

Callender's Hospital Fund

The general meeting of Callender's Hospital and Distress Fund was held recently at the Belvedere Works, Mr. T. O. Callender taking the chair. In spite of the continued depression the Fund maintains its excellent service, and last year grants amounting to £745 were made to hospitals, &c., not to mention £164 for distress grants, &c.

A Commodious New Trolley-Bus

Tramcar capacity with greater flexibility

WHEREAS electric trolley-buses have hitherto accommodated fifty or sixty passengers only, a vehicle has been built by the Associated Equipment Co., Ltd., with electrical apparatus made by the English Electric Co., Ltd., which has seating room for seventy-four people, apart from the driver and conductor and provision for some standing passengers. It has been designed with the definite object of replacing the large-capacity tramcar, and is to be used on the system of the London United Tramways, Ltd.

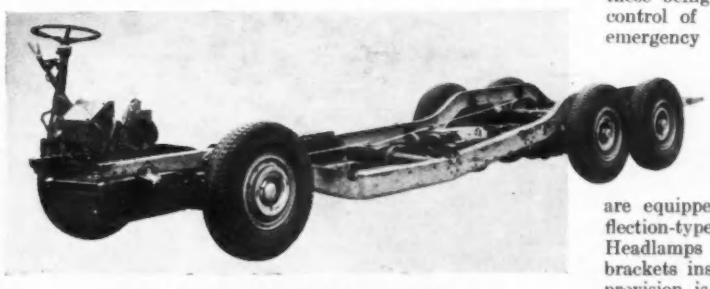
The new bus is essentially of an experimental nature, so that modifications may be made before it is put into production for general service. Specially light electrical equipment and body construction has reduced the weight of the vehicle when fully loaded to 12 tons 10 cwt. 3 qtrs., which is well within the legal maximum of 13 tons. The overall length is 30 ft., the wheelbase 18 ft. 7 in., and the turning circle 66 ft. The abolition of the step and the provision of a central entrance and staircase to the top deck facilitate loading.

The top saloon

Driving Methods

The driving motor is of 80 b.h.p. (B.S.S. one-hour rating) and of the low-speed series field controlled type, with a large range of field shunting. Accelerating current peaks are some 30 per cent. lower than those of an ordinary series machine and the current consumption is 15 per cent. less. The motor is of the box-frame type with a single armature for the usual 500/600-V d.c. system. Special attention has been given to the maintenance of high insulation; on the motor class " B " insulation complies with B.S.S. 173-1928, and the resistances are doubly protected with " dry spot " insulators. The motor is mounted towards the rear in the centre of the chassis and transmits its power through a single short tubular propeller-shaft fitted with 8-in. Spicer couplings. To reduce noise and vibration both the traction motor and Reavell motor-driven air compressor for the brakes are rubber mounted.

When fully loaded the bus is capable of running at 30 m.p.h. on the level and at 18 m.p.h. up a 5 per cent. gradient. The switchgear is of the remote-contactor type actuated by a foot-operated master controller. Both positive and negative line contactors are used; the resistances are connected to the negative side and are fixed under the chassis in front and protected by ventilating grids. The contactors are mounted on the off-side of the chassis in water-tight cases and are easy of access through a movable door on the side of the bus. All the power cables are of the 660-V grade and are cab-tyre-sheathed, being solidly bunched together and cleated rigidly to the side of the chassis frame with hard-wood blocks, so that by this means no cable is permitted to be in contact with metal at any point.



The chassis of the 74-seater trolley-bus

The Construction of the Chassis

The trolley poles and bases are of a new lightweight design (3 cwt. 2 qtrs.). The frame is of the A.E.C. patented construction with a maximum depth of 11¼ in. The Ministry of Transport regulations regarding unladen step height and the 10-in. ground clearance have been complied with. The front springs have hydraulic shock absorbers and the front axle has extra large roller bearings. The Lockheed brake cylinder is incorporated in the king pin, and the steering gear is of the worm and nut type. The rear axles are made from one-piece nickel-steel forgings carrying the worm gearing in separate casings, which have a specially large oil capacity. Heavily constructed bevel-type differentials are used. The 3-in. diameter axle shafts are of 100-ton steel and are mounted on adjustable taper roller bearings. Between the two axle drives there is a third differential. The brakes on all wheels are of the foot-operated internal-expanding type, assisted by Lockheed hydraulic mechanism, which is actuated by compressed air supplied through a single Westinghouse cylinder, with a foot-operated valve. In addition, there is also a hand-operated mechanical brake. All the brake shoes are interchangeable.

A general view of the bus

The body is of advanced design in the matter of light weight and sturdy construction. It provides seating accommodation for thirty-four passengers in the lower and forty passengers in the upper saloon. Both longitudinal and crosswise seats are fitted with Dunlop rubber cushions and squabs and upholstered in moquette. Two half-drop-type windows are fitted on each side of the lower and three on each side of the upper saloon. Double sliding pneumatically operated doors are fitted, these being under the direct control of the driver. One emergency door is provided at the rear of the lower saloon and another in the rear framing of the upper saloon.

Both saloons are equipped with open reflection-type roof lamps. Headlamps are mounted on brackets inside the body and provision is made for adjustment. Side lamps are mounted on the lower belt rail. These lamps are of the bulbless type, the bulbs being inside the body and the reflectors within the lamp body. With the exception of the emergency 12-V bulbs there is no electrical connection between lamp body and lamp. Head lamp bulbs and reflectors are also totally insulated from the outside of the vehicle.

The driver's cab is built in the main body framing and screened off from the lower saloon by a glass partition.

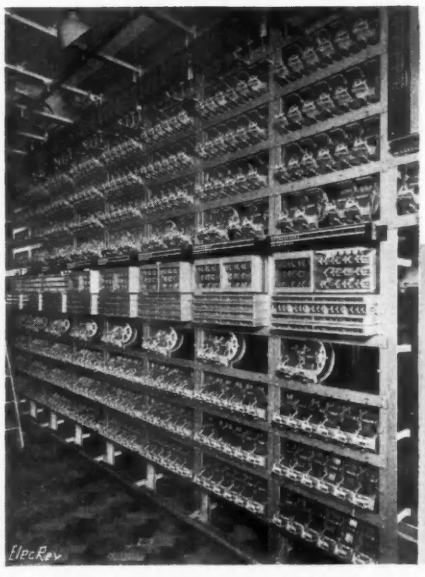
The "Advance" Exchange

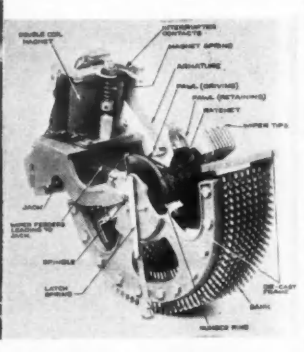
THE system installed at the "Advance" exchange, Bethnal Green, is an entirely new system of automatic telephony, known as the "Bypath" system, devised by Standard Telephones & Cables, Ltd. It is the first all-British automatic system to be put into public service, and its economic and technical advantages were outlined in a recent I.E.E. paper to which reference was made in our issue of January 20th, page 83.

By this system the expensive switching mechanisms normally forming part of the talking circuit and kept in use throughout the conversation, are held in bypath circuits which are only brought into operation for passing a call through the exchange. A saving of approximately 50 per cent. in the amount of apparatus held has thus been achieved. Another interesting feature is that one type of switch only is used instead of various entirely different mechanisms at present employed. An added advantage in these days of high ground rents and building costs is that the whole of the exchange equipment can be accommodated on one floor, though a second floor would have been required for automatic equipment of the old type.

From the subscribers' point of view the bypath system gives faster service on local and long-distance calls, coupled with improved transmission. It also enables a call to follow an indirect route if the direct route is fully occupied. Private branch exchange facilities, enabling a subscriber to add lines as they are required, form another important advantage. Increased natural light is available in the exchange, due to the use of aluminium paint throughout, and a new system of recording the amount of traffic handled has been incorporated. This method is entirely automatic, and records the operation of the switches on a meter similar to the subscriber's meter at present in use. This automatic record will enable the Post Office engineers to see at a glance which routes are being lightly used or overloaded. They will thus be able to level out the distribution of the calls on the various routes.

Another important feature devised to deal with emergency traffic conditions has been introduced into the switch itself. It is possible by a simple operation occupying a few seconds to take out switches from lightly loaded lines and put them into circuits requiring emergency service, thus not only enabling the exchange to meet the requirements caused by an emergency, but also obviating the necessity of carrying large stocks of spares. The exchange has an initial capacity of 3,400 lines, and is capable of being extended to give service to 10,000 subscribers. It was opened on February 23rd by Major C. R. Attlee, M.P., a former Postmaster-General.





Some of the equipment in the "Advance" exchange and the arrangement of the preselector employed

This system is claimed to save 20 per cent. of the exchange cost, 30 per cent. in space occupied, 40 per cent. in weight, 29 per cent. in junctions, and 10 per cent. in current.

Southend Electrical Exhibition

REFERENCE to the recent exceptional progress of the electricity undertaking was made by Councillor J. Le Masurier, chairman of the Electricity Committee, at the opening of the Southend-on-Sea Corporation's electrical exhibition at the Kursaal on Wednesday last week. Congratulating Mr. A. C. Johnson, the borough electrical engineer, and his colleagues on their work, he said that since November, 1929, 80 per cent. of the consumers had been changed over from d.c. to a.c., and 160 miles of cable had been laid. Hire-purchase and assisted-wiring schemes had been introduced with most satisfactory results, while reductions in tariffs during the last three years had resulted in concessions to consumers amounting to nearly £20,000 a year. The number of consumers had increased from 21,500 in 1929 to 25,600, and the annual sales of electricity from 16,000,000 kWh to 22,500,000 kWh (estimated) for the year ending March, 1933. Deploring the insufficiency of electrical publicity, Councillor Le Masurier said that over 600 supply undertakings actually spent less a year on advertising between them than a single tobacco company, and that their expenditure represented only 2¼d. per £100 of capital and 1s. 5d. per £100 of revenue.

Before performing the official opening ceremony, the Mayor, Alderman R. Tweedy-Smith, referred to the Council's decision the previous evening to spend £12,000 on floodlighting, and to carry it out as quickly as possible.

Prominent in the centre of the exhibition was the Corporation's stand on which were displayed the latest electrical novelties, another exhibit arranged by the Corporation being an all-electric flat consisting of a dining-room, kitchen, and bathroom. Fourteen local contractors co-operated in the exhibition, and other standholders included: Messrs. Bastian & Allen, Ltd.; Barker, Young & Co., Ltd.; Beatty Bros., Ltd.; Belling & Co.; Berry's Electric, Ltd.; British Vacuum Cleaner & Engineering Co., Ltd.; Church & Co.; Economic Dryer Co., Ltd.; Edison Swan Electric Co., Ltd.; Electric Fires, Ltd.; General Electric Co., Ltd.; Hailwood & Ackroyd, Ltd.; L. G. Hawkins & Co.; Hotpoint Electric Appliance Co., Ltd.; Jackson Electric Stove Co., Ltd.; R. A. Jones, Ltd.; Santon, Ltd.; Siemens Electric Lamps & Supplies, Ltd.; W. H. Squire; Wm. Still & Sons, Ltd.; and Wilkins & Mitchell.

Demonstrations, lectures, and cinematograph displays were given daily, and two special features were "Eric the Robot" and a colour-lighting demonstration entitled "The Magic of Light." The exhibition was open for a week.

Scenes at the opening of the Southend electrical exhibition. In the right-hand picture Councillor J. Le Masurier, with Mr. A. C. Johnson and Mr. V. W. Dale, is being introduced to "Eric the Robot"

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

How the Central Board Works

A COMPREHENSIVE review of the work of the Central Electricity Board was given to the members of the BIRMINGHAM ELECTRIC CLUB on February 24th, when Mr. S. T. Allen, manager of the Central England District, read a paper on "Electricity Supply Co-ordination."

Having briefly explained the purpose and scope of the 1926 Act, Mr. Allen said that the Central England District covered 7,300 sq. miles and the scheme approved in 1928 provided that the Board should select nineteen of the forty separate generating stations then existing and that a new station should be built at Ironbridge with the addition of six smaller stations for short peak-load work if necessary, giving a total estimated capacity of 1,363,000 kW of plant to be used for the Central England Scheme in 1940.

A scene on the Cardiff-Newport road during last week's blizzard, showing the havoc wrought amongst Post Office lines

The Electricity Commissioners estimated that in 1940 the sum of the maximum demands on these generating stations would be 1,187,000 kW, leaving 176,000 kW of spare plant, and these stations were estimated to send out 3,290 million kWh. The scheme now nearing completion by the Board for transmission lines and transformer stations to connect these stations involved an expenditure of £2,517,343, a difference of £1,080,336 below the original estimate, some of which would be absorbed in completing the scheme. This did not include expenditure due to frequency change. Of the 7,300 sq. miles covered by the Central England Scheme, some 300 sq. miles was supplied at a frequency of 25 cycles and some 338,000 kW of generating plant and about 450,000 h.p. of motors and other plant had to be changed over at an estimated cost of £4,336,700. This frequency change scheme was enormous and complicated in character.

They all had cause to be proud of the high sense of public and co-operative spirit and the good understanding which had existed between all parties to allow already of plant and apparatus in some 200 sq. miles out of the total of 300, affecting some 6,000 consumers and some 276,000 h.p. of generating, converting, and consumers' plant, to be changed over at an estimated expenditure of £2,090,452. As the completion of the Central England Scheme was dependent upon this large frequency-change programme being carried out beforehand, efforts were being made by all parties to accelerate the completion of the work.

In Central England they were entering upon the main operation stage of the grid system. They realised that the very nature of the scheme was a co-operative one, and that the Board, which had been entrusted with the work of co-ordination, could not, by the very nature and limits of its constitution, have any motives except the reduction of the costs of generation. It was hoped that by all pulling together to the common good and by the exercise of that spirit and enterprise which had been so marked in Central England, they might produce such results as would be of great benefit to all sections.

Submarine Cables for Carrier Telephony

OPENING the discussion at the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 23rd on a paper on "The Characteristics of Submarine Telephone Cables at Carrier Frequencies" which was read by Dr. E. W. Smith (to which reference was made last week), Dr. R. A. Rosen maintained that it was too early yet to say that cables had crystallised into the two forms which the author had mentioned. Two cables had been laid between the Isle of Man and Ireland, each of which contained four cores with gutta-percha insulation; they were non-loaded, and were designed to transmit up to 20 kilocycles. Also a coil-loaded cable containing 170 conductors was laid between Sweden and Germany two years ago designed to provide eighty-four twin band channels, equivalent to forty-two audio frequency and forty-two carrier frequency channels. There should have been some reference to these other types of cable, particularly as the number of circuit miles of carrier channels in them far exceeded the number in the single-core type.

The so-called natural inductance of a cable received comparatively little attention in the audio circuits that were loaded, either by coils or continuously, but at carrier frequencies this natural inductance became most important, as it did most of the work, so to speak. Artificial loading was of most value at the lower frequencies. The cost of applying loading material to a cable in thin layers was considerable and at the lower frequencies it was more economical to load only part of the cable with a layer of greater thickness, leaving the remainder without any at all. This type of intermittent loading had been used in the recently laid Anglo-Belgian cable, the object being to provide a small amount of inductance which would be efficacious at carrier frequency. This and other methods were now being investigated.

Gutta-percha and Paper Cables Compared

Mr. C. Robinson expressed the view that the paper had come at an opportune moment. Communication between this country and the Continent had increased at a very rapid rate and it had been necessary to provide a number of submarine cables containing large numbers of telephone channels. It was necessary also to use large cables because the number which it was possible to lay within a given space was limited, chiefly on account of the cost of maintenance. This demand had been met chiefly by the use of lead-covered paper cables which, on the whole, had given very good service. Nevertheless, they had several disadvantages; they were more heavy and difficult to handle, repairs were difficult, and in case of breakdown the lead sheathing became punctured and circuits were put out of service.

Gutta-percha insulated cables avoided these defects to a large extent and for this reason he felt that the author's statement that paper cables would continue to be used in their present field might require some modification. At the same time, he did not think the concentric type of cable, to which so much attention was given in the paper, had much scope of application in and around this country because it suffered from various disadvantages. The quad type of cable was more suitable for this country for the reason that a larger number of circuits was provided.

Capt. A. C. Timmis said that in the Isle of Man and Ireland

cables mentioned by Dr. Rosen, the losses in the teredo brass tape were greater than in the armouring of the cable. If the conditions demanded more than four wires, *i.e.*, more than one quad for any g.p. or paper cable, it might be necessary to put a metallic screen round the quad to reduce the cross-talk at high frequencies.

In the future, two kinds of cable would probably be used round the British Isles. One would be gutta insulated with four cores, perhaps quads having rather big stranded conductors, with carrier systems operating six or eight channels. This type would be unloaded. There might also be an application for a lead-covered paper cable, screened, which might or might not be continuously loaded, and on which the carrier system would probably not be more than one or two channels.

Mr. K. E. Latimer, who was present when the author made his tests on the Teneriffe-Gran Canaria cable, said he was at a loss to explain certain discrepancies, although they might conceivably be due to the presence of lead-covered cable at the shore ends. Mr. M. Van Hasselt asked for comparative sizes and costs of three cables with the same attenuation.

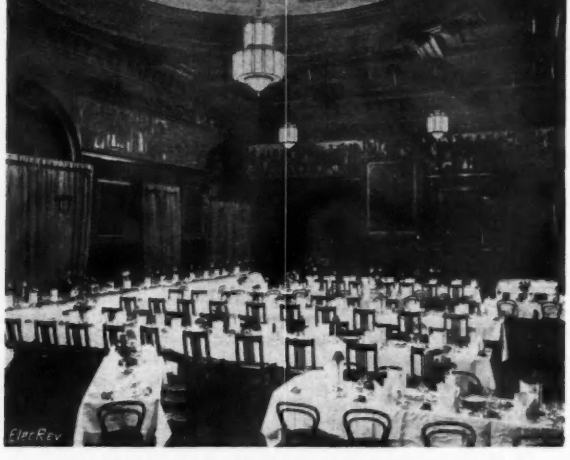
Dr. Smith, replying to the discussion, said that he regarded the K-gutta insulated multi-core cable as a serious competitor of the paper cable. It had been suggested that continuous loading could possibly be avoided by the use of the four-wire system, but continuous loading was a means of increasing the distance over which carrier communication could be carried out. As regarded the rise of resistance with frequency due to the brass teredo tape, experiments suggested that possibly copper would be better than brass, although he hoped that by the time the work in hand was completed a solution would have been found to the problem of screening a cable without introducing losses.

He would endeavour to get out relative costs of different cables as suggested, and he believed that the K-gutta cable would show up very well indeed as against the older gutta cables. The continuously loaded cable would not compare in cost with other forms until the range of the other forms was exceeded because then the other forms would not do the job. The past year had seen a very considerable expansion of land-line carrier working in many countries.

The Future of Neon Signs

THE annual conference of the Master Sign Makers' Association was held at the Dorchester Hotel, London, on February 23rd, under the chairmanship of Mr. A. W. Beuttell.

The chairman, after welcoming the delegates, introduced Mr. W. D. McCullough, chairman of the London Publicity Club, who said that he had often admired the effects achieved by neon lighting in outlining buildings, and added that we could not do better than follow Germany in setting out information in towns clearly and plainly in sign form. The possibilities



The great hall of the Trades House, Glasgow, illuminated by specially designed Holophane fittings

of advertising by neon signs were unlimited, and great good could be done by closer co-operation between the advertising agencies who were specialists in display work and the sign makers. The main channel for future business lay with architecture and the sign trade should be on good terms with the architectural profession.

Mr. T. Armstrong, director of the National Cash Register Co., speaking on "Trade in General," expressed the opinion that there would be a slight, very gradual improvement in trade. He claimed that the salesman was the most important man in any business, and that in the sign trade it seemed to him that the sign salesman had to be both salesman and technician. He quoted examples from his own business of methods of arousing a competitive spirit amongst salesmen. After a discussion in which members expressed general agreement with Mr. Armstrong, the conference adjourned for luncheon.

The afternoon session was opened by a paper read by Mr. E. J. Shuter (Claude General Neon Lights, Ltd.) on "The Building of the Neon Market." The subsequent discussion showed a big divergence of opinion on the vexed question of price-cutting in the neon sign business.

Maintenance Essential

Mr. Shuter commenced his remarks by asking whether the trade was to be carried on by selling quality at a fair price or by selling neon signs down to a price which left little or no profit for the manufacturer—a state of affairs which would impede the research work necessary to improve their products. Orders had been accepted at any price in order to secure business regardless of ultimate results. He considered that it was absolutely essential that signs should be sold with maintenance.

On the question of price-cutting and closer co-operation in the trade, Mr. Shuter made a reference to the new electrical section of the M.S.M.A. which has been recently formed but has not yet commenced to function. It was hoped that when this was in full working order more standardised conditions of trading would be possible and that rules and regulations would be brought more generally into line all over the country. Perhaps also an association, such as the E.L.M.A., could be formed by the neon sign manufacturers to cure the price-cutting which was so prevalent in the trade.

Passing to the question of the development of electricity, he claimed that this was largely due to the Electrical Development Association through the efforts of which the customer had insisted on having electricity in spite of the lack of selling effort by the supply authorities. One difficulty for the salesman and the customer which would have to be overcome was the absence of any standard data for neon signs as compared with existing data for lamp signs, which would give particulars of neon visibility, size of letters suited to any particular display, and other details.

A discussion followed and after passing a vote of thanks to all the speakers the conference passed into private session for the discussion of the M.S.M.A. policy and progress.

Photo-electric Cell Measurements

THE paper which was read by Dr. J. W. T. Walsh before the ILLUMINATING ENGINEERING SOCIETY in London recently outlines the principal characteristics of photo-electric cells so far as they affect the measurement of light. The most generally used apparatus is described, namely, photometers for measuring directional candle-power and integrating luminous flux, and the Elster-Geitel and photo-voltaic cell types for determining illumination.

It might be thought that, having regard to the number of ways in which the response of a photo-electric cell to a given illumination might be affected by quite other factors than the actual value of that illumination, any attempt to use these cells for photometric measurement would be foredoomed to failure. It is a tribute to the patience and ingenuity of those who have laboured in this field that to-day photometry by means of photo-electric cells is rapidly becoming an established technique. The arrangement actually used has generally been dictated by the necessity for avoiding one or other of the several different possible sources of error briefly mentioned in the paper.

When all the precautions mentioned have been taken, it should be possible to measure lamps operating anywhere within the range of 4 to 15 lumens per watt, and over a lumen range of at least 5 to 1 with an error of not more than about 1 to 1.5 per cent. The speed of working is certainly much higher than that attainable in visual photometry to a similar order of accuracy, especially if the almost complete absence of calculation and the simplicity of booking be taken into account. There is, moreover, the great advantage that the work may be performed in a room well provided with daylight, instead of the dark apartment usually associated with photometric work. For the measurement of illumination several portable instruments have been devised and the paper contains brief descriptions of them.

There are a number of other photometric problems in which photo-electric cells have found useful application. Among

these may be mentioned the measurement of transmission and reflection factors. This requires only the measurement of the ratio of two luminous intensities (or brightnesses), and provided that either there is no colour difference involved, or else the cell is corrected by means of a filter, the method may be made very sensitive and convenient in use. In spectrophotometric work, particularly the determination of spectral transmission curves for coloured media, photo-electric methods are frequently used, since no colour-difference is involved. The colour-matching of lamps may be carried out very quickly and accurately by using two different cells, specially sensitive in the red and blue ends of the spectrum respectively.

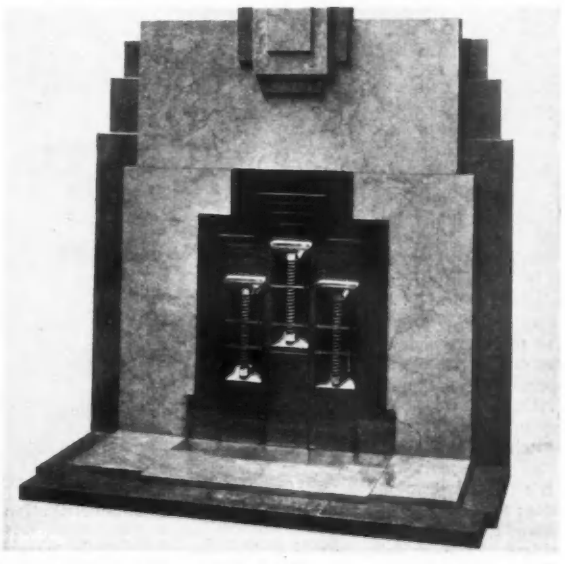
In the control of lamp manufacture the use of cells has been extended beyond the simple measurement of the luminous flux output of lamps. An instrument has been devised in which the efficiency of a lamp, in lumens per watt, is measured in a single operation, while in Germany an automatic lamp-sorting machine is being used to divide lamps into two classes, *viz.*, those that fall within specification limits and those that do not. The many other uses of photo-electric cells in the less familiar branches of photometry include microphotometry, stellar photometry, and colorimetry.

Light Absorption by Ceilings

IN opening the discussion on Mr. Wheat's paper on "The Lighting of Commercial Buildings," delivered at the conference for architects held at the LIGHTING SERVICE BUREAU (see our last issue), Mr. L. H. Bucknell, F.R.I.B.A., expressed the view that in offices partly given up to filing cabinets, plan chests, etc., general lighting might be kept fairly low, and local lighting used where necessary. It appeared to be uneconomical to provide a high standard of general lighting all over a fairly large room which was not used for close desk or drawing board work. Discussing the use of indirect lighting where richly decorated ceilings formed part of the scheme, as was sometimes the practice, he pointed out that the absorption value of such coloured ceilings might be very high and the electrical engineer must allow for more light. The architect should tell the engineer in the first place that he proposed to use coloured ceilings, and not leave him to assume that ordinary light ceilings would be used.

Another point emphasised was that architects should endeavour to make adequate arrangements for providing access to the lighting installations of large rooms and halls. Some lighting fittings suggested that we had not escaped from mistakes such as were made in connection with cast iron in the last century. Many fittings, whether they were called "traditional" or "modern," did not fulfil the requirements of efficiency, except possibly in respect of the actual light value afforded. Many new fittings were as much encumbered with ledges and planes as were the old ones with ornaments. There were long dynamic lines, and useless surfaces were created which became very dirty and could not possibly be cleaned, thus restricting their light output.

Mr. W. J. Jones (manager of the Bureau) reminded the meeting that the new arrangements at the Bureau included a demonstration of the effect of the colouring of walls and ceilings, and the remarkable extent to which it absorbed light; it must be recognised that if colour entered into a scheme of decoration the electrical engineer must be permitted to use sufficient light to take account of the absorption by coloured surfaces. The combination of decoration and ventilation was also demonstrated there. Lighting had been introduced into the ventilation grilles, and so on, in a decorative manner. He mentioned the case of an owner of property in Westminster who had suggested that he could use to very great advantage a laylight illuminated by "daylight" lamps, such as was used in one of the rooms at the Bureau. He had found that by this means he could obtain higher rents for his semi-basement floors.



A handsome and novel electric heating arrangement by Messrs. Bratt, Colbran & Co.

Ship Construction By Welding

DURING the last two or three years there has been a distinct revival of interest in electric arc welding for ship work in this country, says Mr. J. L. Adam in the paper which he read before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND on February 28th.

When careful consideration has been given to all relevant factors, it has justified itself economically and technically in shipbuilding as in other industries. It is probable that both technical and economical exigencies will force an even wider adoption of welding in ship structures and, therefore, the more thoroughly every branch of the subject is explored and the merits and demerits of welding are understood, the more quickly will practice be placed on a sound basis. In this paper references to the metallurgical aspect of the subject are confined to those affecting certain features of design or construction. From tests and experiments which have been carried out, and from experience, certain definite information about welding and welded connections has been obtained, and a short summary of the leading characteristics is included as being essential to a practical understanding of the subject.

Thoroughly sound and effective welding can be carried out in a shipyard, but this does not mean that the welding of a complicated structure, such as a ship, can be carried out satisfactorily by merely installing an effective plant and engaging a sufficient number of trained operators. Such an assumption is almost certain to lead to disappointment and will not advance development of the work.

The British and other Admiralties have accepted welding for important structural work and the classification societies will put no obstacle in the way of the adoption of effective electric arc welding in merchant ships. Welding operations must, however, be carried out under conditions which will enable the classification society concerned to give the shipowner reasonable assurance that the structure is sound, and that assurance must be based on real knowledge of what has been done during the construction of the ship. To obtain such knowledge more is needed than information as to the type of electrode used, and surface inspection of the finished welds. Although X-ray appliances are now employed freely in certain shops for the examination of welds, they are hardly suitable, in their present form, for use in shipyards. It is possible, however, by close co-operation between builders and surveyors, to obtain the required assurance, provided a proper scheme of operations is adopted and rigidly enforced.

* * *

Electricity for the Farmer

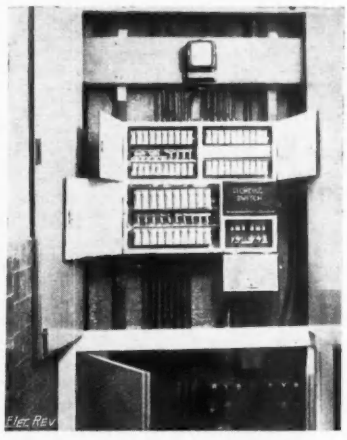
The application of electricity to farming in Great Britain is the subject of the paper which Mr. H. Morrell Wright read before the London Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on February 28th. The first half describes briefly some successful applications, and the remainder discusses schemes and suggestions which are, or might be, employed to further the use of electricity on farms. After referring to the use of power on the land, and mentioning in this connection the electric tractor devised by Major Andrew McDowall, which is capable of carrying out the main tillage operations at a cost comparable with other methods, the author said that one of the chief aims should be to "pre-electrify" the farmer. Every possible means should be adopted to educate him and persistent propaganda is essential with all-electric demonstration farms. The farmer can only use electricity if a suitable tariff is offered to him. A plain two-part tariff seems the nearest approach to the ideal. In order to encourage consumption it is essential that the unit charge be as low as possible. Close co-operation of electrical and agricultural machinery manufacturers will be essential if the farmer is to be equipped with apparatus within the reach of his pocket. In this country hire-purchase schemes seem to be the immediate solution, although we can rely on future developments to bring sufficiently cheap, but still robust, electro-farming units. It is not to be imagined that the electrification of our farms will be a panacea for farming ills, but perhaps it may play a decisive part in lifting the depression which has for so long menaced the farming industry.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

A.C. Motors for Switch Operation

I was very interested in the article in the ELECTRICAL REVIEW of February 17th, dealing with a remotely controlled rectifier sub-station, and the point which particularly arrested my attention lay in the statement of the representative of the Hewittic Electric Company to the effect that it was the first a.c. motor he had seen installed for the duty of closing the main e.h.v. switch. This particular feature has been in operation here for some considerable time on a somewhat identical type of rectifying apparatus for the d.c. supply to a section of the Wolverhampton trolley-bus system. In your issue of October 7th, 1932, page 493, you published a photograph of such a sub-station, and on examination of this photograph it will be seen that the motor-operated closing device is just discernible at the left-hand side.



A light and heat sub-distribution board controlling a quarter of one floor; note links for metering groups of circuits. (See page 304)

In this case the sequence first commences with a low-voltage impulse of about ten seconds' duration from a clock switch which closes a relay giving a 230-V single-phase supply to the motor, which at the end of its closing operation is automatically disconnected by an auxiliary switch opening the same clock switch at the predetermined time; this again gives circuit to a coil which trips out the switch. The apparatus is then ready for the succeeding day's operation. The layout of the equipment has been so designed that it is possible for this gear to be controlled from a distance. In addition, the switch possesses the usual independent protective features.

When this equipment was installed its originality was not considered as such in the least, it having been taken for granted that this was quite an everyday form of equipment. It was supplied to meet my requirements by Messrs. Ferguson, Pailin, Ltd., on whose switchgear it was assembled by my staff. The above constitutes but a link in the chain which has enabled the Wolverhampton transport manager, Mr. C. Owen Silvers, to develop his trolley-bus undertaking on which you expressed such favourable comment on page 454 of your issue of September 30th, 1932. T. A. G. MARGARY.

Electrical Engineer and Manager.

Wolverhampton, *February 23rd.*

Training Electrical Engineers

Recent correspondence in your paper suggests that one of the main reasons for the failure of so many young engineers to get on is that they have no accomplishment beyond their technical knowledge—an insufficient qualification in modern times.

In view of the present serious crisis one may ask with some anxiety whether we are looking far enough into the future and whether we are taking the necessary steps in connection with the education of our children. They will need to be so equipped as to be able to hold their own against increasing competition and under entirely new world conditions. It will be their difficult task to extend our commercial activities in foreign countries, a problem of increasing difficulty. It is time we realised that our national attitude of isolation and mild contempt for everything foreign is a thing of the past.

It is quite generally accepted that our educational system is as yet inadequate to meet modern conditions satisfactorily. Particularly to be deplored is the lack of serious interest in the study of foreign languages. Students have often to interrupt the course of their studies for a considerable period while they are endeavouring to learn a foreign language in the only satisfactory way, that is, amongst the people who speak it. In a world which is becoming every day more international such a state of things is inexplicable.

Organisations exist abroad which make it possible for the students of one country to spend a certain time in another in order to learn that country's language, while at the same time the regular course of studies on which they are engaged suffers no interruption, because the schools of both countries work in close co-operation. Not only does such a system afford every facility for the learning of languages, but it enables every student to become thoroughly familiar with the habits and mentalities of other nationalities. We have made attempts of this nature, but they have usually consisted in the establishment abroad of schools catering almost exclusively for English and American people, a solution which very obviously defeats its own object.

It is surely time that our schools arranged to send each year a certain number of students to foreign schools with which the necessary arrangements have been made along the lines mentioned above. There exist, in Switzerland, for instance, excellent international schools which would fit into such a scheme with the added advantages of an exceptionally healthy climate and the facilities afforded for every form of sport.

W. OLLIVER.

Zugerberg, Switzerland, *February 11th.*

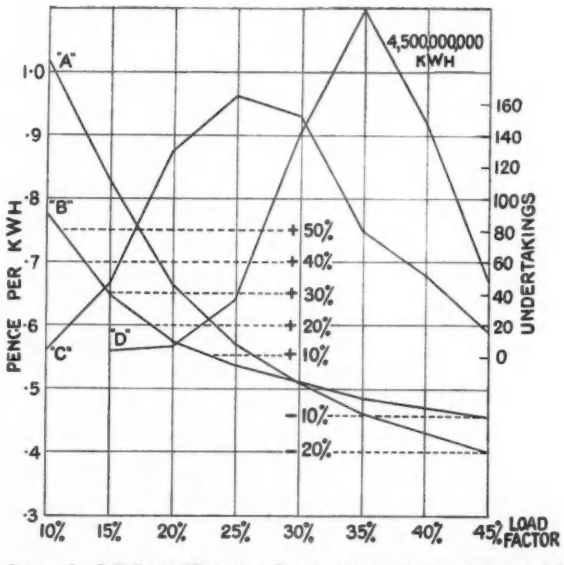
Distribution and the Small Undertaking

Recent discussions on an I.E.E. paper have emphasised the penalty of looking ahead and spending a little more than was perhaps immediately necessary on mains and sub-stations in anticipation of new business. As a cure for these and other evils a new governing body to deal with all matters of distribution has been suggested. If the criticisms already made by those who really know their job is insufficient to condemn such amateur proposals outright, would it not be well to turn our attention to the conditions under which the industry now labours by reason of existing overriding authorities?

Mr. McKenzie of Wimbledon, Mr. Bullen of Welwyn, Mr. Wilson of Ashford, and others, have shown clearly that the m.d. of their undertakings is rapidly moving from the evening to the morning, midday, or Sundays. The last published report of the Electricity Commission shows that the load factors of the 649 undertakings varied from 6.6 to 68.5 per cent. Seven undertakings had load factors of over 50 per cent., but 27.7 per cent. of the total were under 20 per cent., 53.0 under 25 per cent., and 76.5 under 30 per cent. It was calculated that the average for the country would be about 33 per cent.

It is clear from these figures that the large majority of the 649 undertakings need all the help that can be given them by the lowest possible average costs of energy. Bearing in mind the diversity at the time of m.d. and that two separate undertakings each with, say, 20 per cent. load factor, may together result in an average of 33 per cent., is it not astonishing to find that as a result of the C.E.B. tariff the very large majority of the undertakings are to be seriously handicapped in order to give low terms to those who least require them?

Curve C of the accompanying graph sets out the load factor



Curve A, C.E.B. tariff costs; B, an alternative or commercial curve; C, number of undertakings with their load factors; D, kWh generated at different load factors

for the various groups of undertakings referred to in the Electricity Commission's returns and curve A the cost of energy under C.E.B. tariffs to each. The C.E.B. curve of costs continues to fall rapidly to 80 per cent. l.f., when it is 30 per cent. below the cost at 30 per cent. l.f., and still goes on falling to 100 per cent. l.f.; *i.e.*, there is no flattening out. Cost curve B would ensure the same revenue for the C.E.B. at 30 per cent. l.f., be a little less generous to those minority undertakings above 30 per cent., but much more helpful and encouraging to the very large number of undertakings below it who must have better terms or be obliged to limit their possible development.

If, instead of a new governing body to control distribution, a little more effort was directed to securing better conditions for the existing authorities the outlook would be more hopeful. If, for instance, the expert analyses of the Electricity Commission's returns by Mr. D. J. Bolton were more carefully studied, and particularly his reference to the labour of the mathematicians who produce scientifically accurate analyses of costs, only to be thrown to the winds because such results cannot be applied commercially, some ray of hope might exist.

After an examination of the data herewith submitted, if there are any in the industry who believe curve A to be more helpful to the great majority of undertakings than curve B, or to the country generally, then they should be sent to keep company with those who believe that there are millions of working men's homes that can use and pay for 4,000 to 5,000 kWh per annum, plus hire or hire-purchase charges for all domestic apparatus, out of an average income of less than 40s. per week.

A comparison of curves C and D shows that while the number of undertakings with load factors not exceeding 25 per cent. are greater than any other group, the greatest number of kWh is generated by those undertakings operating between 30 per cent. and 35 per cent. l.f., and this group does in fact produce nearly half the whole supply recorded. It provides another very good reason for a cost curve more nearly equal to B, which falls less rapidly after 35 per cent. l.f. than does the C.E.B. tariff illustrated by A.

A. W. BLAKE,
Electrical Engineer, Willesden U.D.C.

London, N.W.6, *February 25th.*

This attractive shop-window lighting installation has just been completed by Messrs. Gaillard Robinson & Co. at the new "Telemac" premises in Regent Street, W. "Geear" reflectors and "Violite" tubes are employed, the neon lighting having been carried out by Borough Electric Signs

Catch Them Young!

If "the child is father to the man" the electricity supply industry should teach the adolescent mind the advantages of using electricity in the service of man. Impress upon the rising generation in elementary schools and other educational institutions that electricity gives convenient and essential service and is labour saving, and the permanence of the electrical idea is assured.

I have studied the attitude of working class people towards such matters in their homes in a provincial industrial district. It is safe to say that if houses were wired free, and no adjustment made for wiring in the price of electricity, about a quarter of the working classes would prefer to remain as they are, for reasons best known to themselves. From my conversation with such people I find that one of the principal reasons is apathy, occasioned by self-satisfaction and lack of imagination, resulting in little desire to improve the standard of living for themselves. Can we alter this state of things in the interests of the industry by securing the co-operation of the educational authorities?

I am confident that our salvation is going to be through the children with the help of school authorities. We must look to these authorities to set a higher standard of culture, to expand the mental range of the child. Can we teach the child mind to become accustomed to an electrical standard for the home by a stimulation of the imagination? Electric cookers should be used for domestic science lectures, water heaters for supplies of hot water, vacuum cleaners for cleaning the premises, electric lighting for illumination, and so on. Perhaps children might be taught the operation of the appliances.

We have no right to assume that electricity in the home is inevitable and that energy sells itself, or that progress is going to be made by crawling over the back of the gas industry. Gas is always competitive and we are not entitled to take for granted that we shall get business willy-nilly because our service is a better one and is sure to become cheaper as time passes. The development of electricity in the home is a responsibility that rests with the present generation.

Walsall, *February 22nd.* A. V. CROSS.

Engineering Apprenticeship

It was with great interest that I read "A.M.I.E.E.'s" letter in to-day's REVIEW, as in some ways his career has so far resembled mine. My apprenticeship was for six years, during which time periods were spent in the winding and insulating departments, in the foundry, the blacksmith's shop, the machine shop, and then in the test department. Through dint of regular attendance at evening classes I obtained a scholarship for the University of Wales, and in 1919 gained the Hughes Memorial Scholarship of the I.E.E. Then after taking my diploma, I passed the A.M.I.E.E. examination in 1921. The whole advance of science and engineering has been by the sustained effort of those who look some years ahead. Events of this last year have too frequently shown that there is a real need for better-trained staffs, since a number of the fatalities that have occurred need never have happened.

Roath, Cardiff, *February 24th.* BERNARD A. CRONIN.

Tariffs for Motor Generators

I seem to recollect having read from time to time cases which have been taken to Court relating to the installation of motor-generator sets in which the owners claimed that the supply authority was not entitled to charge more than power rates although the electricity generated by the motor-driven set was being used very largely for lighting purposes.

If any of your readers can refer me to these cases, I should be very glad to have some information on this matter.

JAMES EDGAR.
Borough Electrical Engineer.

South Shields, *February 21st.*

An Odorous Comparison

When visiting the Building Centre recently I picked up some pamphlets and idly glanced through "The Case for Gas as an Aid to Health" as I made my way round the exhibits. Just when I came to "Fumes—a Fallacy Exposed" on page 4, I was aware of an unpleasant smell. I stopped, breathed deeply, and wished I hadn't. Stepping away from certain exhibits I went to the electrical section and refreshed myself with a deep breath of pure air. As I returned to the questionable area to reassure myself I read on "A properly con-

structed gas stove. . . does not in any way vitiate the air . . ." but the smell was quite distinct.

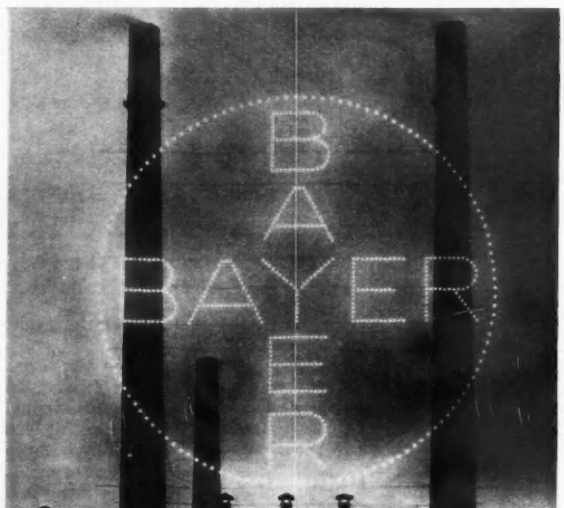
Determined to banish such ungenerous imaginings (for what else could it be?) as I travelled home I quoted to myself from page 6, "The gas fire, then, is thoroughly hygienic in every respect." But in vain the thought persisted that if some poor blind folk visited the Centre their nasal organs would on that day at any rate help them to recognise certain exhibits too readily. Norman H. Bridge.

London, *February 23rd.*

Concrete and Wood Poles

Referring to Mr. Dennison's article on various kinds of poles in your issue of February 24th, I should have thought a wood pole line had a greater margin as regards low cost in comparison with the others than that which he gives, especially in light lines. All the wood poles in this country are, as far as I know, creosoted under pressure and require no further attention, and last anything up to fifty years or more—there are some authenticated instances of seventy years.

As regards maintenance, I am not a maintenance engineer, but so far as I know the cost of maintaining a properly constructed line of creosoted wood poles is negligible, and they require no further attention after erection. Maintenance cost presumably varies very much with the period taken into consideration. I fail to see how Mr. Dennison can make out that the maintenance of such a line is more than that of a steel one—which to my knowledge has to be painted periodically after the galvanising once starts going; and I understand the life of galvanising is very uncertain, at any rate in some atmospheric conditions.



A large advertising sign on two 125-metre chimneys of a dye works at Leverkusen, between Cologne and Düsseldorf. The illuminated circle, which is 70 metres in diameter and consists of 2,000 lamps, can be seen from a distance of 10 km.

Am I not right in saying that concrete poles are liable to deteriorate from frost, &c., and are heavier than wood and require very careful handling, being brittle? I also believe there is a difficulty of attaching arms, &c., to these, unless they are cast with the poles. Also I believe concrete poles take some time to make and set and cannot presumably be made at all in frosty weather. Christopher Wade, A.M.I.E.E.

Bedford, *February 21th*

Shock Protection

After reading the letters of Mr Gilbert and Mr. Parsonage on this subject and in the hope that it will help to prove that the earth leakage protection switches are reliable, I give below experience with a switch installed in my own house

This is a house service type switch, and from it are fed several makes of fires, lighting, water heaters, immersion heaters, a wireless set, and a variety of portable domestic utensils. The original wiring is in tubing and additions have been made, as a separate system but fed from the same switch, in "Kalibond" and for external lights in c.t.s. three-core cable. The switch came from Germany two years ago and has given perfect service. In spite of the apparently delicate mechanism, heavy traffic has never disturbed it, and whenever it has tripped there has been a legitimate cause.

It is possible to test even the earthing of a fitting in a summer-house at the end of the garden instantly by means of a lamp and tails, and the ease with which testing of all apparatus and flexes can be carried out means that it is done regularly. This installation is in a London suburb on single phase 230-V, and my own opinion is that a device of this nature, even if it is never called upon to operate, gives a feeling of security. F. E. H.

February 27th.

Snowstorms and Aerial Lines

It will interest your readers to know that although the supply to many of our rural consumers was interrupted on Friday, I have been unable to trace a single case where the interruption was due to any failure of our overhead mains or services. All the interruptions (except at one point where a grid earth wire dropped across the mains) were due to the extraordinary snow loading causing the Post Office lines to sag or break down on to our lines.

One useful point emerges, which is that in respect of low-pressure aerial distributors—particularly below Post Office or other line crossings—it is desirable that any neutral guard conductor or any other conductor erected above the phase conductors should be at least equal in size to, and preferably strained a little tighter than, the phase conductors so that in the event of the lines above sagging or dropping, the upper conductor will carry them and not sag on to the phase conductor below. Arch. J. Howard,

Taunton, *February 27th.* *Borough Electrical Engineer.*

Peaks and Charges

Regarding the correspondence in recent issues of the Electrical Review under the above heading, so long as the cooking load was largely clear of peak its poor load factor was unimportant, but now that it tends to coincide with the peak it must take its full share of maximum demand charges both for supply and distribution. This problem has arisen in a much more acute form in water heating. Water heaters of the geyser type, with their very high maximum demand and extremely low load factor, would obviously have been unremunerative to the undertakings at any tariff which would be acceptable to the consumers. Consequently lightly loaded storage water heaters have been developed.

I suggest that the only solution to the cooking problem is to be found along the same lines. The electric cooker as we know it, with its total loading of 5 to 8 kW, must give place to storage cookers which take energy from the mains at a low, steady rate and store it in the form of heat until required. No change in cooking methods is required and experience has shown that the service obtained from a 500-W cooker of this type can be superior to that from the conventional type. The energy consumption is approximately double that of the ordinary cooker, but most supply authorities will be able to afford to give such a special tariff that the cost will not be increased.

By way of example I propose to calculate the relative cost of supplying energy to an ordinary cooker having a m.d. of 7 kW and consuming 6 kWh a day and a storage cooker having a maximum loading of 500 W and consuming 12 kWh a day, for a supply authority which is buying energy in bulk at £3 10s. per kVA of maximum demand and 0.2d. per kWh. The maximum demand due to the ordinary cooker is assumed to be 1 kVA at the supply point on the h.v. distribution system (*i.e.*, a diversity factor of 7 to 1) and 1.75 kVA on the l.v. distribution system (*i.e.*, a diversity factor of 4 to 1). The cost of distribution and management will vary between wide limits, but I will take the figures given by Woodward and Carne (I.E.E. *Journal*, December, 1932), *viz.*, £0.69 per kVA of effective demand at time of heavy h.v. load and £2.31 at time of heavy l.v. loads. The annual costs in the case of the two cookers then work out as follows:—

	Storage Cooker.		Ordinary Cooker.	
Electricity ...	½ kVA ... £1 15 0		1 kVA £3 10 0	
	4,380 kWh . 3 13 0		2,190 kWh . 1 16 6	
		£5 8 0		£5 6 6
Per kWh ....0.3d.			0.58d.	
Distribution:				
½ kVA h.v. load ...	0 6 11		1 kVA 0 13 10	
l.v. load ...	1 3 1		1.75 kVA .. 4 0 9	
		£1 10 0		£4 14 7
Per kWh .... 0.08d.			0.52d.	
Distribution losses (7½%) .		0 10 4		0 15 1
		£7 8 4		£10 16 2
Total per kWh 0.41d.			1.18d.	
Revenue .... At ½d. ...		9 2 6	At 1d.	9 2 6
Profit		£1 14 2	Loss	£1 13 8

If the diversity factor at time of heavy h.v. and heavy l.v. demands be taken as 10 to 1 and 5 to 1 respectively the total cost for the ordinary cooker comes to £8 11s. 9d.

It may be suggested that the method adopted by Woodward and Carne for the allocation of distribution and management charges favours the storage cooker unduly, but since the cost of energy in the case considered is almost the same for both types of cooker and the cost of distribution is obviously lower for the storage than for the standard cooker, the conclusions cannot be far out. O. W. Humphrys.

Wembley, *February 27th.*

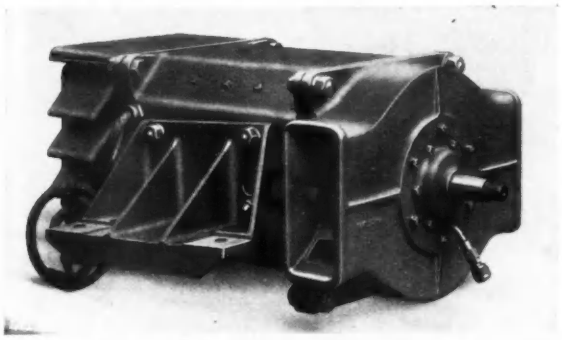
New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A New Motor for Trolley-buses

In less than ten years the conditions of service for trolley-bus motors have changed immensely. The problem has been to produce a motor capable of giving about 80 h.p. at the one-hour rating, complying with British Standard Specification, and capable of carrying heavy overloads, of running at very high speeds, and, at the same time, to effect a saving in weight.

MESSRS. RANSOMES, SIMS & JEFFERIES, LTD., Orwell Works, Ipswich, who employ motors of their own manufacture for driving their trolley-buses, have been successful in all these points, and in their latest design of motor, which weighs only 900 lb. and can be rated at 80 h.p. or more, advantage has been taken of all the most modern methods in manufacture



The new 80-h.p. Ransome trolley-bus motor

to gain this end—light alloys, electric welding, asbestos insulation, &c.

The motor has been subjected to rigorous tests as a plain series motor, and also as compound-wound for regenerative control and also when arranged for series field regulated control. These tests have taken place not only on the test-bed but on the road, where excellent results have been obtained, among which a speed of 26 m.p.h. up a gradient of 1 in 12 can be mentioned, and speeds exceeding 40 m.p.h. on the level were frequently obtained with no signs of overheating or sparking. As regards acceleration, a single deck vehicle attained a speed of thirty miles per hour in the short time of twenty seconds.

Rectifier Battery-charging Sets

The following notes concern some new models which the WESTINGHOUSE BRAKE & SAXBY SIGNAL CO., LTD., 82, York Road, King's Cross, N.1, has added to its range of rectifier battery-charging equipments.

Style "R.G.C.7" (£22) is a small-output set with two separately controlled circuits, one for from one to fifty cells at up to 0.5 A (or one 120-V h.t. battery at 0.25 A), and the other for from one to twenty-five cells at up to 2 A. Each circuit is controlled by a three-way transformer tapping switch, and an adjustable resistance for fine adjustment between these tappings. The full-load consumption is 325 W.

The "R.G.C.7" Westinghouse battery-charging equipments

Model "R.G.C.8" (£27 10s.) is designed to charge from one 6-V to six 12-V batteries in series, in steps of 6 V, at 6 A. The output is regulated by two four-way rotary tapping switches, one providing coarse control, the other enabling fine control of the current between successive steps on the coarse control switch. A length of three-core cable is provided for the a.c. input, one lead being for the earth connection. The minimum and maximum outputs are one 6-V battery at 6 A, six 12-V batteries at 6 A, respectively. The full load consumption is 1,000 W.

For charging h.t. batteries only, with no provision for a higher charging rate than 0.25 A, there is style "H.T.C.1" (price £23). Four independently controlled circuits are provided, with one moving-coil milliammeter which can be switched into any one circuit to indicate the charging current in that circuit. The outputs on each of the four circuits are one 60-V battery at 0.25 A, or one 120-V battery at 0.125 or 0.25 A. Each circuit is controlled by a separate sliding resistance, and a switch is provided for isolating each circuit when required. The maximum loading is 250 W, and the dimensions are: width, 15 in.; depth, 11 in.; and height, 20 in. This charger is well ventilated and is so designed that it can be mounted on a wall.

"Bakelite" Thermal Flashers

We recently inspected a sample of the new "Bakelite" thermal flashers which are being supplied by MESSRS. M. NEWMARK & Co., 77, Milton Street, E.C.2. It fits a bayonet lampholder, and can be obtained for both 100/130 and 200/250-V circuits. The capacity is 40/100 W, with a guaranteed life of 1,000 hours; the weight is one ounce, and the length 2¼ in.

The sample we examined flashed thirteen times to the minute, each flash having a duration of about 2½ secs. As the flasher is of the thermal type it is necessary to leave it "on" a minute or two before flashing commences until it gets warmed up to the required temperature. The retail price is 6s.

A "Bakelite" flasher

A Neat Moulded Switch

The new "Cygnet" 5-A switch, marketed by the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, W.C.2, is of simple design and has a strong moulded base and cover, the latter allowing the dolly to fit flush in the slot, without leaving a gap exposed to collect dust.

The Cygnet switch

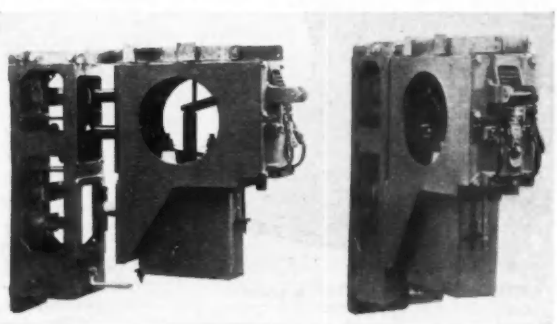
A strong shock-proof dolly is provided, and should this be broken, no live parts are exposed. The action is of the q. m. and b. underslung type, and the price of the surface type is 11s. per dozen (one-way) and 18s. 8d. per dozen (two-way). Semi-recessed patterns cost 1s. 4d. more per doz.

A Compact H.V. Draw-out Switch

The latest development of MESSRS. J. G. STATTER & CO., LTD., 16, Great George Street, S.W.1, is a compact single-phase wall-mounting oil switch. It is designed for normal working at 2,200 V, but it is insulated so that it will withstand pressures up to 6.6 kV between the contacts, a feature enabling the unit to be used as a coupler between phases, &c., on the higher voltages.

The stationary contacts are of the spring finger self-adjusting type, and are liberally rated with heavy sparking tips. The moving contacts are of hollow wedge section, giving added strength and automatic oil pressure on the sparking tips at the time of opening. Overload calibrations are arranged from normal to twice normal full-load current. Sizes are available for 15 to 400 A, and all overload coils between 15 and 150 A are specially rated actually to carry continuously their overload current. For example, a 50-A breaker calibrated at 50/100 A can be run continuously at 100 A, an advantage on systems where load unexpectedly increases.

Adjustable time lags can be fitted on all the overload trips. On the stationary portion there are: one phase busbar with a socket and automatic shutter, a feeder cable socket, the neutral bar, a neutral link (opening automatically when the switch is withdrawn), a cable clip and socket for the neutral



Statter wall-mounting, draw-out switch in isolated and non-isolated positions

cable, and a cable box with a gland for one concentric or two single-core cables arranged for bottom entry, with bushes or glands on either side in the case of a single or end unit. The draw-out portion is definitely interlocked to

prevent withdrawal or reinsertion, or removal of the oil tank with switch "in." When tripped the switch can be withdrawn either by hand direct or by a withdrawing tool to a limiting stop on the overhead sliding rails. At this point it can be padlocked, and the tank removed, so giving full access to the switch without danger to the operator.

A special device enables the automatic features to be locked off. Two sliding plates, one having a rotary motion and the other a backward and forward motion, give the effect of one plate moving in front of the other, and a clear indication is given on the exposed plate as to whether the switch is automatic or non-automatic. Units can be fitted at 7-in. centres, so making very compact equipment for such applications as kiosk sub-stations.

Dual-wattage Lamps

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, announces that it is now marketing a dual-wattage "Osram" lamp for hospitals, nurseries, &c. The price of the lamp is 5s., and it gives a light of 25 or 4 W. Control is by means of two cords, and an opal glass bulb is employed.

The new G.E.C. dual wattage lamp

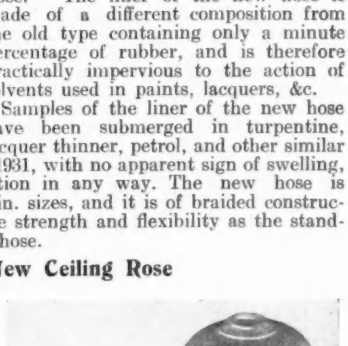
A New Fluid Hose

The AEROGRAPH CO., LTD., Lower Sydenham, S.E.26, is now supplying a new form of the "DeVilbiss" fluid hose. The liner of the new hose is made of a different composition from the old type containing only a minute percentage of rubber, and is therefore practically impervious to the action of solvents used in paints, lacquers, &c.

Samples of the liner of the new hose have been submerged in turpentine, lacquer thinner, petrol, and other similar materials since March, 1931, with no apparent sign of swelling, hardening or deterioration in any way. The new hose is supplied in ⅜-in. and ½-in. sizes, and it is of braided construction possessing the same strength and flexibility as the standard "DeVilbiss" fluid hose.

A New Ceiling Rose

A patent ceiling rose has just been placed on the market by MESSRS. C. W. OUTRAM & CO., LTD., Woodville, near Burton-on-Trent. The standard type of brass fittings are employed, but the cover screws entirely over the base. The ceiling rose is subjected to stringent tests of insulation efficiency, and is produced in the best quality English vitreous material.



A new ceiling rose

An Electric Power Gramophone

Claims of unusual quality of reproduction and volume are made for the "Philivox" electric power gramophone recently introduced by PHILIPS INDUSTRIAL, Philips House, 145, Charing Cross Road, W.C.2.

A pleasing all-metal cabinet is fitted with an electrically driven turntable, pick-up, automatic brake and a scratch filter, as well as a permanent-magnet moving-coil loud speaker and baffle board. The amplifier incorporates a rectifying valve, pre-amplifying valve and a power pentode. A length of flexible lead and a two-pin plug for connection to a.c. mains are provided, and sockets for the loud speaker leads are conveniently placed at the back where there are also sockets for the connection of a microphone or radio receiver.

The "Philivox" electric power gramophone

The pick-up, a recent production, is exceptionally light in weight, being constructed of "Philite," and has a magnetic chuck which allows the needle to move freely in the record groove. The floating action of the needle ensures minimum loss of the high notes, while the pentode valve guarantees excellent reproduction of the lower registers. With the magnetic chuck needles can be changed instantly. The volume control is conveniently situated at the back of the pick-up arm, and functions for radio and microphone as well as gramophone reproduction. The price is £35 including a permanent-magnet loud speaker (not shown in the illustration).

An Electrical Coach Speedometer

The recent Ministry of Transport Order requiring all express road coaches to be fitted with speedometers has imposed upon the designers of these instruments an entirely new set of conditions. There is little doubt that the electrical speedometer has advantages over the mechanically operated one, but there are difficulties in connection with d.c. indicators for road vehicle work, owing to the delicate nature of the commutator and brushes. The smallest trace of dust or, worse still, of grease on the commutator throws the equipment out of action.

The generator and the indicator of the Everett, Edgcumbe a.c. speedometer for road coach work

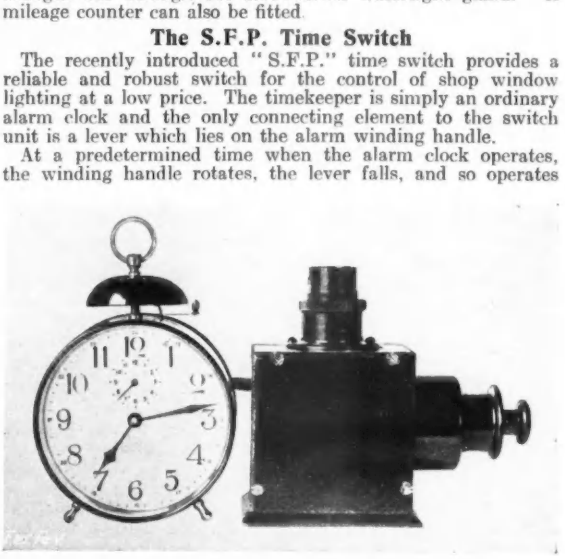
MESSRS. EVERETT, EDGCUMBE & CO., LTD., 117, Victoria Street, S.W.1, have recently designed a combination to overcome these difficulties. The generator has all its windings fixed, the rotating permanent magnet of cobalt steel generating an alternating voltage, so that no commutator or contact of any kind is involved. In the past the electrical speedometer has almost invariably been of the d.c. pattern, in order that a moving-coil indicator could be used, with its advantages of an evenly divided scale, robustness, large working forces and perfect "dead-beatness," but Everett, Edgcumbe have succeeded in retaining all these advantages, whilst at the same time permitting the use of an a.c. fixed winding generator. The speedometer drive is carried through a boss on the side of the gear box, and the generator is firmly held on to it by a split collar tightened up by a bolt and nut.

The body of the generator measures only 2⅝ in. in diameter by 3¼ in. long, and the indicator itself may be of any size. The dial may be illuminated in the ordinary way through the generator and the indicator by a small armoured twin cable brought out through the screw-down watertight gland. A mileage counter can also be fitted.

The S.F.P. Time Switch

The recently introduced "S.F.P." time switch provides a reliable and robust switch for the control of shop window lighting at a low price. The timekeeper is simply an ordinary alarm clock and the only connecting element to the switch unit is a lever which lies on the alarm winding handle.

At a predetermined time when the alarm clock operates, the winding handle rotates, the lever falls, and so operates the switch, which is of the mercury type rated at 10 A. A switch unit only which can be used in conjunction with any alarm clock sells at 12s. 6d., a complete instrument costing 18s. 6d. The switch can be converted to switch "on" instead of "off" by reversing the mercury tube in its holder, and where it is desired to switch both "on" and "off," as on early closing days, two switches can be used in series, one controlling the "on" and the other the "off."



The "Cockorse" time-switch

An industrial ironclad model in course of production and costing £1 (clock, 6s. extra), will be most useful for controlling baking ovens which are left on during the night hours, or for heating up soldering pots, &c., before work commences.

For domestic use a model known as the "Cockorse" is supplied. This has a "Bakelite" lampholder and plug fitted to the casing into which any domestic appliances can be plugged. The "Cockorse" switch is fitted with a 6-A mercury tube, and the equipment retails at 12s. 6d. without clock. The manufacturers are the S.F.P. ELECTRICAL CO., North Bar Works, Banbury, Oxon.

A Contractors' Vade Mecum. By T. C. Gilbert

READERS of the articles by Mr. H. R. Taunton that have appeared from time to time in this journal would naturally expect a high standard from him, but he has easily excelled himself in his latest production,* which may well become a classic in its sphere. In his preface the author says: "I should be sorry to think that in thirty years of electrical contracting I had not managed to pick up something useful that is not common knowledge," but even if he had not—which is far from being the case—the manner in which he treats his subject would make a reiteration of the old things not only bearable but enjoyable. The volume is packed from cover to cover with sound practical ideas, and the entertaining tone of the book is set by the quotation from Hilaire Belloc (who is, I should imagine, Mr. Taunton's favourite author) which appears upon the title page:—

> Lord Finchley tried to mend the electric light
> Himself. It struck him dead—and serve him right.
> It is the business of the wealthy man
> To give employment to the artisan.

A real indication of the book's contents can only be given by means of a few extracts, in the author's own easy and readable style, although the trouble with such a step is to decide where to commence and where to stop. In the first few chapters, Mr. Taunton deals with matters of general organisation, staffs, etc., on modern lines, "as electrical contracting is not the rule of thumb business it was, say, twenty-five years ago," but even these dry-as-dust subjects appear in a new guise that will bring smiles to the face of the most jaded contractor. Take, for example, "Goodwill in almost any contracting business attaches to the individual and not to the firm, and is not worth 'tuppence' as a selling proposition and less as a buying one." "If you are looking for an illustration of a particular sin against the wiring rules of the I.E.E. you have only to look round the office installation of any well-established firm of contractors." Or this ungallant statement—"Lady canvassers have been tried—not with conspicuous success. Apart from a proverbial fluency, the average woman has few of the necessary qualifications." Mr. Taunton is deservedly caustic regarding the selling staffs of some contractors, "In far too many cases they are ignorant store boys or junior clerks, lacking in every virtue of a salesman, even elementary courtesy."

Mr. H. R. Taunton, whose new book is reviewed on this page

He is also an authority on typists; his ideal is one who "will not transcribe the engineer's carefully worded technicalities into balderdash"; she must not be "too obviously marriageable" as "the length of her stay is usually in inverse proportion to her charm," and "no good-looking girl looks upon business as a career." Of employés generally he says—"Each and every one of them is working not from love of the *beaux yeux* of their employer, nor from any lofty ideals of service, but to get a living, and on the best terms they can." So, "pay the employé of proved ability a generous wage" for "the loss of a good man may—like a vote—count two on a division; your loss may be a competitor's gain." "The man who says he does not want a holiday should be suspect. He is either afraid of a discovery in his absence of some gross delinquency, or he needs the attention of a mental specialist." "The contented plodder and the man who 'hath no ambition in his soul' is of little use in the world of electrical contracting."

Untitled Heads

Mr. Taunton is far too kind to the principal: "We must take him as he is. He is not likely to be convinced of his unfitness for his job and dismiss himself." "Like happy ships, there are 'happy firms' where the principal engenders that *esprit de corps* so essential to the smooth conduct of a complicated business organisation." But, "probably 90 per cent. of the leading men in the trade are without initials after their names." If this is so, it is all wrong, as many of these men could qualify for membership of some technical body involving initials, and they owe it to the industry to do so. Mr. Taunton is inclined to acquiesce in this state of affairs, and personally I should have liked him to castigate the principal who thinks only of the business side of his craft, although, taking everything into account, perhaps discretion——

A very useful chapter on obtaining orders—"a million pounds and all the red tape in Whitehall cannot extract success from an empty order book"—deals with canvassing and following up inquiries, whilst advertising has a chapter to itself. How will this be relished by the advertising fiends ("who talk of 'casting bread upon the waters' and throw the whole bakery overboard")? "Not a doubt of it, the most and best orders come to the contractor who works quietly along his own lines without unnecessary publicity or fanfare of trumpets to waken his competitors," but general guidance as to displays, postal publicity, shop windows and showrooms, with a digression on English, follows. Some very sound ideas as to the correct amounts to be allocated for publicity are put forward which are worth many times the cost of the book.

Chapter V deals with correspondence and filing, with all its detail of morning mail, classification of papers, filing systems, &c., whilst Chapter VI is entitled "Dealing with Inquiries." The most interesting portion of this will be that devoted to meeting irresponsible competition, and although "there is no obvious remedy for this evil except by such broad and slow means as the education of the public and the gradual elimination of the lower grade of contractors" yet some useful hints are given as to the best means of meeting it. Specifications and the vexed question of main contractors' discounts all receive their share of attention, whilst supply companies' regulations are dismissed with the airiness that their exaggerated importance warrants.

Where the Register Fails

The consultant will find his little fads treated with a smiling tolerance, but ample space is devoted to that serious grievance of the trade, the excessive number of firms who are allowed by public bodies and some consultants and architects to quote to their requirements. An instance is given where forty firms were invited to submit tenders for a contract, and an attempt is made to estimate the losses incurred thereby.

Mr. Taunton, although not of an iconoclastic turn of mind, enjoys a few tilts at established institutions: he has "no time for" the B.S.S. Code of Graphical Symbols, calling them "clumsy and unsatisfactory." He unerringly puts his finger on the weakness of the National Register, and states that this weakness is due to two main causes. The first is inadequate funds, which prevents adequate advertising and will not allow for systematic inspection of installations; the other, and more serious, reason is that the control of the National Register is in the wrong hands. "It is managed by a Board composed of nominees of almost every conceivable section of the industry, of whom only a small minority—seven out of twenty-six—represents the contractors. It is argued that this eclectic body of Olympians is necessary to inspire confidence in the public, who would have no faith in a register controlled by the contractors themselves. What nonsense!"

Mr. Taunton says that only two parties have any interest in it; the public, theoretically, and the contractors, practically. "What real interest have the supply authorities (five members) in a high standard of installation work? Generally speaking, if they have any, it is in the opposite direction, towards a cheaper standard."

Technical Matters

Although primarily treating with the business side of contracting, as the title suggests, the book does not neglect technical questions. In Chapter VII, "The Technical Side," these matters are adequately discussed; "the contractor must have, besides a reputation for business integrity, proved technical qualifications, wide and up to date. Permanent success in a technical trade is only to be ensured by a thorough technical equipment," whilst "it is better to have a high standard, and sometimes fall from it, than a low one and never rise above it."

It is quite impossible to treat of even a small part of the author's contentions within the scope of a brief review, and I would urge electrical contractors even to descend to stealing a copy if they have no other means of obtaining one. Space will not allow of extracts from such important chapters as estimating, material and plant, stores and stock, foremen and electricians, work in progress, invoices and time sheets, costing, standing charges, accounts department, and trade organisations, all of which are dealt with in a delightful way. The chapters on "The Politics of the Industry" and "The Future of Electrical Contracting" are of absorbing interest.

Interesting reference will be found to "The Grading of Electricians," with some good advice to the E.T.U. Mr. Taunton has something to say regarding compulsory registration and compulsory regulations, and can even put up a defence of that universally maligned body, the wholesalers. In short, he sets out clearly and expertly the full requirements for a successful electrical contracting business. I am a little alarmed to think how few contractors' establishments of which I have knowledge come within recognition distance of some of the recommendations contained in the book, but the industry will be the better for Mr. Taunton's effort.

* "Electrical Contracting—Organisation and Routine," Sir Isaac Pitman and Sons, 12s. 6d. net.

Dutch Electrical Imports and Exports

FROM the trade returns just to hand we have compiled the appended tables showing the Dutch imports and exports of electrical machinery and allied material during 1932 as compared with the preceding twelve months. It will be seen that both branches of the trade have been seriously affected by the general industrial depression, imports showing a decline of £1,793,585, or nearly 40 per cent., and exports a decrease of £1,631,600, or over 27 per cent. For purposes of comparison the Dutch guilders have been converted at the old rate of 12 to the £.

IMPORTS.

		1931. Quantity.	1931. Value £.	1932. Quantity.	1932. Value £.
Electrical machinery and parts	tons	3,372	461,000	1,345	171,415
Telegraph and telephone apparatus, material and parts	,,	3,308	599,330	3,097	442,915
Radio apparatus and parts	,,	2,991	1,052,080	2,448	677,915
Incandescent lamps	No.	4,287,600	110,415	6,722,000	72,500
Arc lamps	tons	14	3,165	14	2,830
Copper and brass wire and cables, not insulated	,,	7,305	357,250	4,218	142,915
Electric vacuum cleaners	No.	59,628	280,415	51,924	182,250
Wire and cables, insulated	tons	21,345	746,250	11,583	336,000
Bulbs for electric lamps	,,	125	7,000	102	5,500
Electric locos. and vehicles	,,	704	81,165	60	6,330
Other electrical apparatus	,,	6,781	830,415	5,975	694,330
Total imports...			£4,528,485		£2,734,900

Germany continues as the leading supplier of electrical machinery, followed by Belgium, the United States, Great Britain, Switzerland, and Sweden. Telegraph and telephone material also came chiefly from Germany, Belgium, Great Britain, and Sweden, Germany being credited with more than 50 per cent. of the total radio apparatus purchased, followed by Great Britain, Hungary, United States, France, Austria, and Belgium. With regard to electric lamps, Japan appears to be swamping Holland with cheap goods, that country being credited with 4,130,200 of the total, valued, however, at only £9,330, as against 1,173,700 (£14,500) from Germany, and 532,100 (£15,500) from Belgium. According to the returns, imports of lamps from Great Britain are negligible. Germany and the United States control the bulk of the trade in non-insulated wires and cables, the United Kingdom being third with but a small total. The vacuum cleaner trade in Holland is mainly in German articles, of which 36,043 were imported as against 8,451 from Sweden, 3,438 from the United States, 1,975 from Italy, and 855 from Great Britain. Germany again leads in the case of insulated wires and cables, being credited with £279,165, or over 83 per cent. of the total.

EXPORTS.

		1931. Quantity.	1931. Value £.	1932. Quantity.	1932. Value £.
Electrical machinery and parts	tons	1,530	151,580	904	90,580
Telegraph and telephone apparatus, material and parts	,,	398	34,080	216	21,080
Radio apparatus and parts	,,	8,476	4,046,580	6,358	3,203,330
Incandescent lamps	No.	29,153,100	1,108,500	195,972	623,500
Arc lamps	tons	162	23,580	60	6,080
Electric vacuum cleaners	No.	1,535	6,000	3,598	12,750
Copper and brass wire, not insulated	tons	440	23,080	704	22,660
Wire and cables, insulated	,,	6,302	271,580	3,608	130,250
Electric locos. and vehicles	,,	51	4,330	103	11,580
Other electrical apparatus	,,	1,859	301,500	835	217,330
Totals			£5,970,810		£4,339,140

Turning to exports, it will be seen that the reduced trade has affected almost every item. No information is given regarding the distribution of radio material and electric lamps, which form by far the major portion of the Dutch shipments. Germany, however, was the principal purchaser of Dutch electrical machinery, followed by Belgium and the United Kingdom.

The British Industries Fair

AT the official luncheon given on February 22nd by the Birmingham Chamber of Commerce and the Fair Management Committee Mr. W. L. Chance, vice-president of the Committee, was in the chair. Sir Arthur Stanley, proposing "The Electrical Industry," said that in Germany industry was 75 per cent. electrified, in the U.S.A. 80 per cent., and in Britain only from 40 to 50 per cent. Birmingham Corporation was now selling at the rate of 400 million kWh per annum to 130,000 consumers, of which 50,000 had been gained during the last three years; this result was largely due to the co-operation of all sections of the industry, including the trade unions.

Lord Barnby (C.E.B.), responding, referred to the need for a combined national effort in the development of distribution. The experience of engineers on the National and Regional Consultative Committees would be very helpful in securing the 600,000 new consumers per annum that we should expect to obtain. Generating plant installed since 1924 was greater than the total installed at that time. The economy complex had been overdone, and wise expenditure should be encouraged. He suggested that a stimulus could be given to trade by suspending the sinking fund and lowering the income tax.

The second "electrical" lunch was held on Wednesday last, when representatives of E.D.A., I.M.E.A., and other bodies attended. Mr. C. D. Taite (Lancs Electric Power Co.), in the course of a speech, said that the change brought about by the grid gave the industry an opportunity of revising its policy regarding national propaganda, the co-ordination of tariffs, and the merging of small undertakings in larger units.

The Management Board of the British Industries Fair at Birmingham did not issue on Saturday an official statement of business done during the six days, but inquiries indicated that the attendance of home buyers, engineers, and delegations was fully up to the average. The distribution of business was unequal. In the heavier branches, it was reported, it proceeded cautiously, although it was pointed out that inquiries rather than sales were to be expected. Some useful orders for batteries for electric vehicles were placed, and a substantial order was received for circuit breakers from a Scottish municipality. Heavy sales were reported in incandescent lamps, one of these transactions having been made on behalf of Australia.

One firm's early business consisted of good sales in electri drills, magnetic separators, electric welders, and 6,000 ft. of tubular heating. Welding machines commanded much attention. There was a very large number of transactions in domestic heaters and fires and accessories.

Exhibitors generally expressed confidence in the outlook, regarding the Fair chiefly as a medium of propaganda and advertisement.

E.A.W. Visits

About 220 members of the Birmingham and Midlands Branch of the Electrical Association for Women visited the Birmingham section of the Fair on February 21st and were entertained to tea by the Fair Management Committee and the local Chamber of Commerce. On February 23rd members of the Rugby, West Midlands, and Cheltenham Branches, accompanied by about sixty students from the domestic science schools in Birmingham, paid a similar visit.

In the Courts

IN the Chancery Division on February 21st Mr. Cecil Turner, for the plaintiffs in the action of Tankard & others against the Ingleton Electric Lighting & Power Co., Ltd., applied for the appointment of a receiver and manager of the company. He said this was a debenture-holders' action, the plaintiffs holding two debentures for £1,250 and £500.

The company did not appear. The principal moneys under the debenture became due in 1925, and there were arrears of interest amounting to £1,675. By the direct invitation of the Electricity Commissioners the plaintiffs were proceeding in this way. They asked the Court to appoint Mr. F. Harrison, of Bradford, receiver and manager. The undertaking was being carried on, and counsel did not think there would be much change in the management.

Mr. Justice Luxmoore assented to the appointment of Mr. Harrison as asked, but directed that he was not to act beyond July 15th without the leave of the Court.

Damages Against E. K. Cole, Ltd.

In the King's Bench Division on February 22nd Mr. Justice Du Parcq concluded the hearing of an action brought by Mr. John Pearl (trading as Pearl & Pearl, radio dealers), of Armitage Row, N.W., to recover from E. K. Cole, Ltd., damages for alleged breach of a contract of August 18th, 1931, for the sale and delivery to the plaintiff of radio sets.

Mr. Wallington said that the plaintiff's case was that the defendants had failed to deliver a number of radio receivers which were the subject of a contract partly in writing and partly oral. Eighty-six sets were ordered and a term of the contract was "delivery as required." The contract was entered into on August 18th, 1931. The plaintiff gave evidence to the effect that by reason of the defendants' failure to deliver the balance of the goods ordered he had sustained a loss of profit of £255.

Sir Leslie Scott, K.C., for the defendants, contended that there was no legal obligation on them to deliver the sets claimed and, further, that in the circumstances and the events which had happened the plaintiff had waived any rights to further deliveries. Sir Leslie stated that a fire which had occurred in the defendants' office had destroyed all their documents. Immediately afterwards they asked the plaintiff to tell them what orders he had given, but he did not give that information. He submitted that the defendants were not liable for any loss incurred by the plaintiff.

His Lordship held that the plaintiff was entitled to judgment and awarded him £250 damages and costs.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

A Novel Employment Scheme

An appeal to residents in Ipswich to provide employment by having their houses wired for electricity is made in the local Press by Mr. Hampton E. Blackiston, chief engineer and manager of the Corporation Electric Supply and Transport Departments. The average cost of a small installation, says Mr. Blackiston, is £5, and this can be paid for in cash or by hire-purchase, or the wiring can be hired. If the Electricity Department receives that support which is necessary to ensure the addition of 5,000 more consumers during the coming year, the result will be the employment, for twelve months, of 200 men who would otherwise be unemployed. It is suggested that groups of householders would like to combine to give thirty orders for installations and, collectively, to nominate some unemployed man in whom they are interested to be employed by the Electricity Department for twelve months.

A novel form of "Crompton" lamp "sandwich board" now being used in certain provincial towns

A New Santon Factory

The new factory, stores and offices of Santon, Ltd., at Newport, Mon., were recently formally inaugurated by the Mayor (Councillor W. J. Wall). The new factory has a sheet-metal department, and a department for cellulose spraying, while the main works are divided into sections for the manufacture and assembly of the company's products. Accommodation is also provided for the storage of raw material and the packing and despatch departments, while the first floor is devoted to offices and canteens.

"Credalux" Lighting Fittings

The range of electric lighting fittings previously manufactured by Simplex Conduits, Ltd., Credenda Conduits, Ltd., and their associated companies, is now manufactured under the name of "Credalux" and distributed solely by the newly constituted Simplex Electric Co., Ltd. A general reduction has been made in the prices of vitreous enamelled industrial lighting fittings, all of which have been redesigned to suit the new size of lamps according to the revised B.S.S. No. 161 issued in August, 1932, and a number of new designs of reflectors and diffusing units have been put on the market.

The F.B.I. and the Budget

Last week the Chancellor of the Exchequer received a deputation of the Federation of British Industries which put forward the Federation's views in connection with the forthcoming Budget. A reduction in income tax was the chief measure advocated for the assistance of industry.

Municipal Wiring at Preston

Questions were asked at the Preston Town Council meeting last week concerning the work of the Electricity Committee in undertaking the wiring of houses. Alderman Hubert wanted to know if any profit was being made on the wiring of houses, and, if so, would those who in the future wanted their houses wired get the advantage of it. Councillor Rhodes, chairman of the Electricity Committee, said that they did make a profit; if they did not they would not be able to run the department. They could not give the people who were prospective consumers advantage over any other consumers in the district. The contractor could charge under the list price, and very often the Department found itself charging more than he was.

The Electrical Trade Protection Association

The annual general meeting of the British Electrical Trade Protection Association, 5, High Holborn, W.C.1, was held at Sentinel House, London, on February 21st, when the secretary reported that progress had been well maintained during 1932, the work accomplished by the Association being nearly double that of the preceding year. The office bearers elected for 1933 were: Chairman, Major Hogan (Hogan & Wardrop, Ltd.); vice-chairman, Mr. F. W. Evans (National Electrical Supplies Co., Ltd.); executive committee, Messrs. P. L. Dwyer (P. L. Dwyer and Co.), J. P. McKenzie (Sifam Electrical Instrument Co., Ltd.), and G. A. Harrowell (C.C.A. (Central Cables and Accessories) Ltd.).

Duties on Carbon Electrodes

By a Treasury Order issued on February 22nd the import duty on amorphous carbon electrodes has been altered to 10 per cent. *ad valorem*. The amorphous carbon blocks defined in the Order are used in the production of aluminium. They have been exempted from Key Industry Duty on the ground that they are not made in the Empire in quantities substantial in proportion to the United Kingdom consumption and that there is no reasonable probability that they will be so made within a reasonable period. In consequence of this exemption, however, they have become liable to an additional duty under the Import Duties Act besides the general *ad valorem* duty. This is undesirable, and the Committee has accordingly recommended their exemption from the additional duty.

The South London Exhibition

The third annual South London Exhibition opens at the Crystal Palace on March 8th. There will be a number of electrical exhibits.

The Southampton Docks

The Southern Railway has issued its handbook for 1933 of the Southampton Docks. This well-illustrated publication of 175 pages is on similar lines to previous issues, and, in addition to particulars of rates and charges, contains a considerable amount of general information.

A Frigidaire Sales Conference

The annual sales conference was held by Frigidaire, Ltd., at the Hotel Metropole, on February 23rd and 24th. In his opening speech Mr. H. L. McGurk, managing director, said that the conference was the largest ever held by the company, an encouraging sign in these times of depression. The proceedings began with presentations by Mr. G. D. Riedel, president, to the prize-winning salesmen of the European Frigidaire Club. Mr. C. C. Kline spoke on "What the Club Means To You." An innovation was the introduction of each speaker by means of a film, showing him on his way to the conference, until, at the final "fade-out," he was revealed in person, on the stage, ready to begin his speech.

Telephone Manufacture in Shanghai

According to the *Chinese Economic Bulletin*, the plant for the manufacture of telegraph instruments, established by the Ministry of Communications at Shanghai, is to be enlarged to include the manufacture of telephone apparatus and instruments. In view of the fact that supplies are being obtained from abroad at exceedingly high prices, owing to unfavourable rates of exchange, the Ministry has decided to start making the apparatus it needs.

Diesel-electric Rail Cars

The Diesel-electric rail car which has been making demonstration runs between Euston and Birmingham during the period of the British Industries Fair is of 250 h.p. and is

The E.D.A. March window display

equipped with a special electric generator designed and manufactured by Laurence, Scott & Electromotors, Ltd., with motors and control gear by the General Electric Co., Ltd. It is one of three similar cars which have been built for English railways by Sir W. G. Armstrong, Whitworth & Co. Laurence, Scott & Electromotors, Ltd., have also supplied to Messrs. Armstrong complete electrical equipments, including generators, control gear, and motors, for four Diesel-electric rail cars and shunting locomotives recently supplied to the Baroda State Railways, India, and they have in course of manufacture two 800-h.p. generators for main-line Diesel-electric locomotives for the same company, as well as a 450-h.p. generator.

New Municipal Showrooms

Stoke Newington Borough Council has decided to have designs prepared for new municipal buildings, including electricity showrooms, in Church Street. The existing showrooms are in a practically dead road—Edwards Lane—next to the electricity station.

Swindon Town Council has applied for sanction to a loan of £8,000 for the erection and equipment of electricity showrooms and public offices in Regent Circus.

The Kettering Electricity Committee has asked Messrs. Coales & Green, architects, to prepare plans for the erection of offices, showrooms and stores in Adam and Eve Street.

Dover Town Council has received sanction to a loan of £6,700 for the provision of a new electricity showroom and offices in Ladywell.

The E.D.A. North West Area Luncheon

There was a record number present at the annual luncheon of the British Electrical Development Association, North West Area, at the Midland Hotel, Manchester, on Tuesday last. In proposing the toast "The E.D.A.," the Lord Mayor of Manchester, Ald. W. Walker, M.I.E.E., referred to the fact that a large proportion of the number of electrical undertakings were gaining advantage by the efforts of E.D.A. although they were not members. Response was made by Sir Felix J. C. Pole, vice-president of E.D.A., who appealed for a 100 per cent. E.D.A. To utilise the grid fully, he said, it was necessary to have lower tariffs for energy and a definite undertaking that the supply would not be cut off unless it was vitally necessary. Prizes were then presented to the winners of the E.D.A. Public Speaking Competition. Mr. C. D. Taite (Lancashire Electric Power Co.) proposed the toast of the chairman, Mr. S. E. Britton, who briefly responded.

For Sale

The London and Home Counties J.E.A. has for sale Diesel engines, alternators, switchgear, &c.

Poplar Borough Council has turbo-alternators, &c., for disposal.

(See our classified advertisements.)

New Use for Siemens Floodlight

An interesting installation of Siemens floodlight projectors on the theatre stage was used in the production of a new play entitled "Once in a Lifetime" at the Repertory Theatre, Birmingham. The photograph, which was reproduced by courtesy of the *Birmingham Mail*, shows one of the scenes—a talkie

A good example of stage floodlighting

studio in which a wedding ceremony is portrayed, five Siemens floodlights being employed. The play is now being produced at the Queen's Theatre, London, with the same cast, scenery and electrical equipment.

Scottish Contractors' Dinner

The annual dinner of the Edinburgh branch of the Electrical Contractors' Association of Scotland was held in Edinburgh on February 24th. Mr J. Watson Deans, chairman of the branch, presided, and among the company were Lord Provost W. J. Thomson and the Lady Provost, Lord and Lady Wark, Mr. J. L. Anderson (president) and Mrs. Anderson, Mr. W. B. Williams, president of the Electrical Contractors' Association (England), Mr. D. Foster, president E.W.F., Mr. W. F. Moir, chairman of E.L.M.A., Mr. H. A. Lingard, Councillor H. White, Mr. C. W. Sully, Mr. and Mrs. D. Pratt, Mr. F. C. Vine, A.M.A., and Mr. D. Dundas, chairman of the Glasgow branch.

Mr. W. Finlay, secretary, who proposed "Our Guests," said the Corporation Electricity Department had all along realised that it was in the interests of the department to make the contractors their allies and not their opponents. Mr. W. B. Williams, Mr. D. Foster, Mr. W. F. Moir, and Mr. J. L. Anderson replied. In the course of his remarks Mr. Foster referred to the forthcoming speech which Sir Andrew Duncan was to make in Birmingham, and said that he understood there would be revealed plans for the future development of the "grid." The supply undertakings in general had very grave problems to face, and the contractors, wholesalers, and all sections of the industry must be prepared to be helpful. It should not be forgotten that the electrical contractor had from the earliest days given time, energy, and money to further the aims which were now the aims of the supply industry and the electrical industry in general.

The Sub-Contractors' Federation

The annual meeting of the National Federation of Specialists and Sub-Contractors was held in London on Thursday last week. The report for the past year which was presented gave a list of members including the Electrical Contractors' Association and the National Association of Lift Manufacturers. Among the matters touched upon was the question of deposits with tenders. An instance was quoted in which a non-returnable deposit of two guineas was required in connection with tenders for an electrical installation. The Council passed a resolution deprecating this practice and forwarded it to the proper authority. In connection with the 1931 form of main contract a "contracts tribunal" has been set up under the chairmanship of Mr. S. Tatchell, vice-president, R.I.B.A.; and the Federation has nominated the chairman as its representative

Electrical Commercial Travellers

The Electrical Trades Commercial Travellers' Association held its annual dinner on February 24th, Mr. H. Manning, the chairman, presiding. Sir Philip Nash, in responding to the toast of "The President," said that the members were lucky in being in an industry which had not felt the depression so keenly as other industries. Even in these days Great Britain was increasing its consumption of electricity while other countries were showing decreases. People were saying that the British salesman was a "back number" and could not compete with foreign salesmen, but he did not agree with this. The British salesman was as good as ever he was and was second to none. He had visited the London section of the British Industries Fair and was amazed at the progress of British industry since last year, which showed that the British manufacturer was putting forth great efforts and meeting with success in making his goods more acceptable in foreign markets.

Councillor C. Whinnerah (chairman of the Erith Education Committee) proposed "The Association and its Charities," and Mr. Manning, in responding, said the Association could have doubled its membership of 350 if it had not insisted upon getting the right type of man. He referred with regret to the passing of Mr H. Wynne Roberts, one of their vice-presidents. The grid was getting to work and the electrical commercial traveller was growing more and more important: there was a great need for salesmen in the work of distribution.

Trade Announcements

The Artofex Engineering Works, Ltd., has moved its offices and works to Great Cambridge Road, Enfield, Middlesex (Telephone: Enfield 2112).

Messrs. J. G. White & Co.'s telephone number has been changed to City 5201.

Contractors and Co-operation

The Sheffield branch of the Electrical Contractors' Association held its annual dinner on February 23rd, Mr. A. J. Ward presiding. Mr. Cecil F. Pike, M.P. for Attercliffe, Sheffield, who proposed "The Association and Allied Organisations," said it was as well, in view of the modern tendencies, to dispense with old ideas, and members should link themselves up in the closest possible way and use their collective ability to produce the best results. There was a tendency on the part of the trade to regard with disfavour the action of corporations, combines, and monopolies in doing the work themselves rather than letting it out to tender. He had no doubt that this problem would continue to exist, but in view of the trend of affairs there was an urgent need for a greater measure of co-operation between private individuals and the corporations. Much of the work of the electrical contractors in the past had been confined to individual rather than to community and collective requirements. He urged them to regard the problem of electricity in the future more from the community than the individual standpoint.

Mr. W. B. Williams, president E.C.A., in reply, said that if the electrical industry were to take its place in national life and obtain fair trade and labour conditions, assistance must be given by the engineers, manufacturers, and wholesalers in

co-operation. Ninety per cent. of the responsible electrical contractors of the country were members of the Association.

The general secretary (Mr. L. C. Penwill), who also replied, said that whilst the Association was anxious to increase the membership it did not wish to do it at the expense of efficiency. In considering the installation of electricity in homes throughout the country they could not ignore the dangers which followed bad workmanship. The Association had a membership of 1,400 throughout the country, but unfortunately there were still fully qualified men who remained outside the ranks. He believed that there was abundant need for the introduction of Government regulations with regard to the wiring of houses. There should also be a compulsory scheme for the registration of electrical operatives. The time had arrived when the public should be made aware of the dangers to life that often accompanied bad wiring. Mr. H. J. Couzens, the Sheffield branch chairman, toasting "The Guests," said that the Sheffield City Council had promised that there would not be a continuance of competition with private traders. The Master Cutler (Lt.-Col. A. N. Lee), Councillor John Green, and Ald. E. Wilson also spoke.

Social Events

The staff dinner and dance of Premier Electric Heaters, Ltd., was held at the Imperial Hotel, Birmingham, on February 17th. There were 125 members and their friends present, and Messrs. G. Collins and H. Collins (directors) also attended.

There were about 200 guests at the Seymour Hotel, Totnes, Devon, on February 24th, when members of the grid construction staff of Callender's Cable and Construction Co., Ltd., gathered from all parts of the southern counties for a dinner and dance. Mr. P. V. Hunter presided, and among those present were Mr. Howard Foulds, secretary of the company, Mr. E. C. Stewart, chief engineer of the S.E. England District, Mr. F. de B. Hart, head of the overhead department, Mr. W. D. Orchard, chief surveyor for the S.W. England District, Mr. C. F. Barrow, of Exeter, resident engineer for the South-West England District, who made the arrangements for the function, Mr. Nichols Moore, and Mr. Christopher Wade. The toast of "Callender's" was proposed by Mr. Christopher Wade, and responded to by the chairman and Mrs. Barrow. Mr. Foulds proposed "The Guests," to which Mr. Nichols Moore and Mr. F. Hulland, managing director of Messrs. Millicans, Ltd., responded.

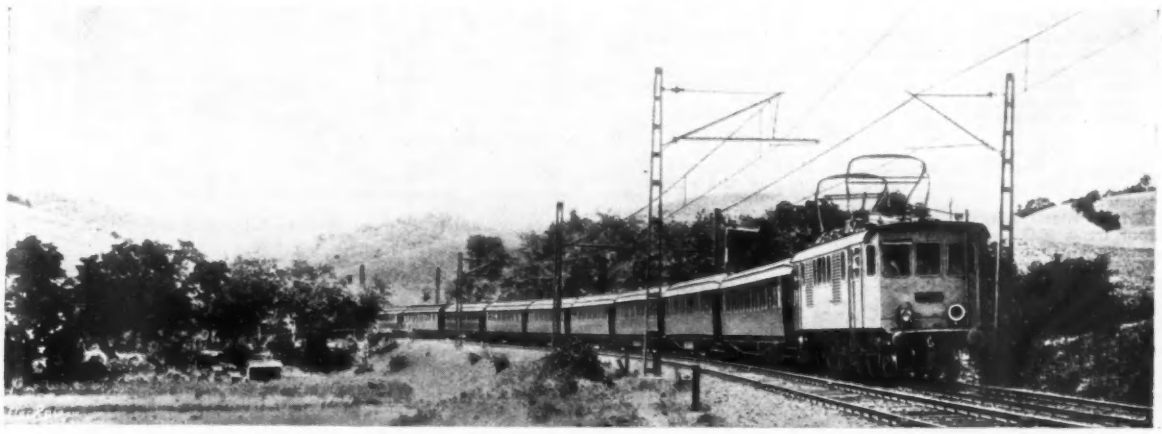
The Manchester Magnet Amateur Dramatic Society gave excellent performances of Anthony Armstrong's comedy, "Well Caught," in the Lesser Free Trade Hall, Manchester, on February 21st and 22nd in aid of the Electrical Industries Benevolent Association. Mr. W. Leslie Booth was responsible for the production, and also played one of the parts. It is hoped to hand over a sum of £50 to the Association.

The Polish Electrical Trade

According to a statement issued by the Polish Electrical Manufacturers' Association, the value of the output of electrical manufacturing establishments in Poland declined to approximately 40,000,000 zl. last year, as compared with 90,000,000 zl. in 1929. The fall in electrical imports was even more severe, namely, from 130,000,000 zl. to 15,000,000 zl. Whereas four years ago imports in this branch of trade exceeded the country's output by 50 per cent., last year they were equivalent to only 40 per cent. of local production.

Recent Contract

Arrangements have been concluded whereby some 800 tons of work approaching £250,000 in value for the Hungarian State Railway will now be put in hand by the Metropolitan-Vickers Electrical Co., Ltd. The work includes a further twenty-six motors each of 2,500 h.p., with the greater part of the control equipment for a similar number of locomotives. Most of the work will be done at the company's Trafford Park works, but some will be carried out at its subsidiary works at Attercliffe, Sheffield. This work forms part of a contract, entered into in 1931, for four complete sub-station equipments, and motors and control gear for thirty-six electric locomotives. All the sub-station equipments have been delivered, and two are now in commission. The contract provided for preliminary completion and tests of two passenger and two freight locomotives before proceeding farther with work on this section of the contract. Last year the two passenger locomotives were submitted to exhaustive tests and were put into regular service in September, since when they have averaged 300 miles a day each. The two freight locomotives have been similarly tested and put into regular service. The Hungarian railway electrification scheme is of considerable technical interest, because the system adopted, which was devised by an eminent Hungarian engineer, the late Kalman de Kando, has entirely new features, the trolley wire being fed with 16,000-V single-phase power at 50 cycles, this supply being transformed to polyphase power by a Kando phase convertor on each locomotive.



One of the new electric passenger locomotives drawing a 590-ton train on the Hungarian State Railways

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

	Price March 1st.	Fortnight's Inc. or Dec.
CHEMICALS, ETC.		
a Acid, Oxalic ... per cwt.	50s.	—
a Ammoniac, Sal ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ,,	£17	—
a Copper, Sulphate ... ,,	£19 15s.	—
a Potash, Chlorate ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ,,	6d.	—
a Shellac T.N. ... per cwt.	£3	—
a Sulphur Commercial ... per ton	£11	—
a ,, Roll ... ,,	£11	—
a Soda Chlorate ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... per lb.	4d.	—
METALS, ETC.		
b Aluminium, Ingots ... per ton	£100 to £105	—
b ,, Wire ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... per ton net	£138	£3 dec.
Grade II ... ,,	£98	£1 dec.
Grade III ... ,,	£53	—
c Brass (rolled metal 2" to 12" basis) ... per lb.	6¾d.	—
c ,, Tubes (solid drawn) ... ,,	8¾d. to 9d.	—
c ,, Wire, basis ... ,,	7¼d.	—
c Copper Tubes (solid drawn) ... ,,	9¼d.	—
g ,, Bars (best selected) ... per ton		
g ,, Sheet ... ,,	£61	—
g ,, Rod ... ,,		
d ,, (Electrolytic) Bars ... ,,	£36 5s.	—
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£41 15s.	—
d ,, ,, H.C. Wire ... per lb.	6 5/8 d.	—
f Ebonite Rod ... ,,	1/3 to 1/6	—
f ,, Sheet ... ,,	1/3 to 1/6	—
n German Silver Wire ... ,,	2/2	—
h Gutta-percha, fine ... ,,	nom.	—
h India-rubber, Para fine ... ,,	4¼d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig ... ,,	£12	5s. inc.
g Mercury ... ... per bot.	£9 5s. to £9 15s.	7s. 6d. to 12s. 6d. dec
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	10½d.	—
p ,, ,, rolled strip & sheet ,,	10½d.	—
p ,, ,, wire ... ... ,,	11½d.	½d. dec.
o Platinum ... ... per oz.	£7	—
d Silicium Bronze Wire ... ... per lb.	7¼d.	—
r Steel, magnet, in bars ... ... ,,	7¼d.	—
g Tin, Block (English) ... ... per ton	£147 to £149	£2 10s. to £2 15s. dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	2/11	—

Quotations supplied by:—

a G. Boor & Co.
b The British AluminiumCo., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
f W. F. Dennis & Co.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.

The Pope's Radio Set

With reference to the illustration of the radio set presented to the Pope which appeared in our issue of February 10th (page 208), Messrs. Feeny & Johnson, Ltd., inform us that the set was presented by the manufacturers, Messrs. Fabbrica Italiana Magneti Marelli, of Milan (whom Messrs Feeny & Johnson represent in this country), and not by the City of Milan as stated.

New Catalogues and Lists

English Electric Co., Ltd., Stafford.—Leaflet describing a new Diesel engine.

Display Motor & Accessories Co., Ltd., 94, Charlotte Street, W.1.—A catalogue giving particulars of a new range of small motors for sewing machines, &c.

Pressed Steel Co., Oxford.—A leaflet giving details of a new domestic refrigerator.

Philips Industrial, 145, Charing Cross Road, W.C.2.—A loose-leaf catalogue of the company's products, and list No. B.306 describing oxide cathode cinema arc rectifiers.

Charles Selz, 47-49, New Cavendish Street, W.1.—A leaflet giving details of the "Reposalite" reflector shades.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, E.C.4.—Publication No. 1004, relating to "Monogram" and other cast-iron fans.

Lancashire Dynamo & Crypto, Ltd., 94, Petty France, Westminster, S.W.1.—A number of illustrations of the company's products.

British Electric Domestic Appliances, Ltd., 3, Hanover Court, Moor Lane, E.C.2.—A showcard referring to the "Mary Ann" vacuum cleaner.

F. Whitelegg (Wire Machinery), 35, Union Road, S.E.16.—An illustrated list (No. 103) of special machinery for the wire, electrical and radio trades.

Donovan & Co., 46-47, Great Charles Street, Birmingham.—Publication No. 332, illustrating and describing "Star" lighting units.

Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.—A brightly coloured window streamer relating to the Philips four-valve battery-operated radio receiver.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1.—Literature in connection with Hotpoint-B.T.H. domestic electric cookers, together with a new electrical appliance folder.

Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs.—A leaflet illustrating and describing the new "Guardian Angel" electrically illuminated bumper posts for traffic control purposes.

All British I.D.L. Electric Lamp Co., 173-175, Great Portland Street, W.1.—The company's latest price list.

Elliott Brothers (London), Ltd., Century Works, Lewisham, S.E.13.—Catalogue No. 815, giving details of the "Siemens" automatic regulator for heat economy and control.

Wild-Barfield Electric Furnaces, Ltd., Elecfurn Works, North Road, Holloway, N.7.—A leaflet describing the company's forced air circulation furnaces.

Bankruptcy Proceedings

R. O. Woodruff, electrical and radio engineer and contractor, 4, Bridge Parade, Godstone Road, Purley.—An application for discharge was heard recently at Croydon. The Official Receiver said that the receiving order was made on June 10th, 1932, on the debtor's own petition. According to the statement of affairs returned the ranking liabilities amounted to £691, but proofs actually admitted and probable claims not lodged totalled £707. The assets had realised £119, and a first and final dividend of 1s. 6½d. in the £ had been paid on proofs for £611. The discharge was granted subject to twelve months' suspension.

Benjamin Glassman (known as Bernard Glassman, and trading as B. Glassman and Alfa Radio Co.), wireless dealer, 2, Hillcrest Avenue, Golders Green, N.W.—The statutory first meeting of creditors was held on Monday at the London Bankruptcy Buildings. The liabilities amounted to £1,194 against assets of £1, apart from book debts of doubtful value. The failure is attributed to inability to recover the amount due from Direct Sales, Ltd.; to liability under guarantees given on behalf of the company; to general trade depression, &c. The case was left in the hands of the Official Receiver. The following are the principal creditors:—Electrical & Radio Products, Ltd., £171: Tyrela Radio Co., Ltd., £239; Detex (1931), Ltd., £70; British Clarion Co., Ltd., £56; J. L. Gottlieb, £200.

M. Haar (lately trading as the "Fleet Electric Service"), electrical engineer, 26, Ivy Lane, Newgate Street, E.C.—This debtor applied last week at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the debtor petitioned the Court in December, 1931, with liabilities of £434 and assets of £5. The application was opposed by the Official Receiver upon four statutory grounds, and the discharge was suspended for eighteen months.

H. E. Hewitt, electrical engineer, 55, Park Road, Hornsey N.—The first meeting of creditors was held last week at London Bankruptcy Buildings. The liabilities are roughly estimated at £300, against assets of £32, apart from any surplus in respect of a leasehold house, which is mortgaged. The Official Receiver was left in charge of the estate.

E. Taylor, electrical engineer, 85, Strathmore Road, Hinckley.—Receiving order made February 20th on debtor's own petition. First meeting March 6th at the Official Receiver's Office, 1, Berridge Street, Leicester. Public examination, April 7th, at the Castle, Leicester.

J. Burgess (Burgess Radio Co.), 136, Highland Road, Southsea.—First meeting March 3rd at the Official Receiver's Office, 87, High Street, Portsmouth. Public examination March 6th at the Court House, St. Thomas's Street, Portsmouth.

M. Tinner (Yorkshire Trading Co.), electrical factor, 91, Porter Street, Hull.—Last day for receiving proofs for dividend March 4th. Trustee, Mr. J. E. D. Stickney, 1, Parliament Street, Hull, Official Receiver.

D. T. Donovan (London Electrical Co.), 119, St. Mary Street, Cardiff.—Application for discharge to be heard April 4th at the Law Courts, Cardiff.

D. C. Bailey, wireless dealer, 22, Doncaster Road, Barnsley.—Last day for receiving proofs for dividend March 8th. Trustee, Mr. C. C. Saxton, 14, Regent Street, Barnsley.

C. Bassham (Ashton & Holt), electrical engineer, 16, Cross Street, Ryde, I. of W.—Last day for receiving proofs for dividend March 7th. Trustee, Mr. F. H. Langmaid, 87, High Street, Portsmouth, Official Receiver.

H. L. McIvor, electrical engineer, 92, High Street, Ewell.—Receiving order made February 18th on debtor's own petition.

Company Liquidations

English Cable Supplies, Ltd., 14, Stanley Street, Liverpool.—At the meeting of the creditors held on February 16th, at the Chartered Accountants Library, Liverpool, the statement of affairs showed liabilities of £4,797, of which £4,563 was due to the trade. After allowing £196 for preferential claims, the net assets were £2,705, or a deficiency of £2,091, as regarded the creditors. The company was registered in 1924 with a nominal capital of £2,500, of which £1,052 had been issued. The deficiency as regarded the shareholders was £3,143. It was pointed out that the turnover of the business had steadily grown. In 1925 the turnover was £3,400, whilst for the year to March, 1932, it was £16,600. Resolutions were passed confirming the voluntary liquidation of the company with Mr. P. E. Wallis and Mr. P. S. Booth, Liverpool, as joint liquidators, whilst a committee was also appointed. The principal creditors are: British Thomson-Houston Co., Ltd., £444; Electric Lamp Factors, Ltd., £721; Foster Engineering Co., Ltd., £95; General Cable Mfg. Co., Ltd., £643; General Electric Co., Ltd., £300; Kerson Manfg. Co., Ltd., £82; Longmore Bros., £134; Philips Lamps, Ltd., £92; Stearn Electric Co., Ltd., £242; Warrington Electric Cable Co., Ltd., £88.

Terrytone Radio Products Co., Ltd.—The statutory first meetings of the creditors and shareholders were held on February 17th at the Board of Trade Offices, W.C., before Mr. G. Hutcheson, Assistant Official Receiver. A statement of affairs was submitted showing liabilities £2,624, against assets £612, and a deficiency of £2,112 with regard to contributories, the issued capital being £100. The failure of the company was attributed to heavy overhead expenses, cost of experiments, purchase of components unsuitable for the company's receivers and the making of chassis and cabinets which could not be sold. The liquidation was left in the hands of the Official Receiver.

Beam, Ltd., 35, Farringdon Road, E.C.—Under the compulsory liquidation accounts have been lodged showing total liabilities of £15,632 (ranking £15,450), assets of £208, and a deficiency of £15,884 with regard to contributories. The following are the principal creditors:—British Blue Spot Co., Ltd., £119; British Zonophone, Ltd., £145; Chloride Electrical Storage Co., £237; E. K. Cole, Ltd., £671; A. C. Cossor, Ltd., £148; Ediswan Electric Co., Ltd., £496; Forket Engineering Co., Ltd., £244; W. Garrard, £4,985; General Electric Co., Ltd., £233; Mullard Wireless Service Co., Ltd., £584; C. Marquis, £878; Marconiphone Co., Ltd., £290; Pye Radio, Ltd., £154; Philips Lamps, Ltd., £101; Siemens Electric Lamps and Supplies, Ltd., £1,138; V. Zeitlin & Sons, Ltd., £865.

L. Kremner, Ltd., wireless manufacturers and wholesale factors, Manchester.—The liquidators in the voluntary winding up of this company have issued a summary showing their receipts and payments from May 18th, 1932, to February 17th last. Receipts have amounted to £13,081, and dividends totalling 6s. 8½d. in the £ have been paid to creditors for £32,234.

Arthur Smith (Radio), Ltd.—Winding-up voluntarily. Liquidator, Mr. K. D. Hutton, 5, John Street, Bedford Row, W.C.

Eunice Radio Co., Ltd.—Winding up voluntarily. Liquidator, Mr. C. Turner, 155, Norfolk Street, Sheffield.

Charles Robert Dibben, Ltd.—Meeting, March 29th, at 115-119, Moorgate, E.C., to receive an account of the winding-up by the liquidator, Mr. H. N. Phillips.

English Cable Supplies, Ltd.—Winding-up voluntarily. Liquidators, Mr. P. E. Wallis, 9, Harrington Street, Liverpool, and Mr. P. S. Booth, 2, Bixteth Street, Liverpool. Particulars of claims to the liquidators by March 17th.

J. & E. Matthews, Ltd.—Particulars of claims by March 22nd to the liquidator, Mr. W. F. Chaundy, 71, Temple Row, Birmingham.

Private Arrangements

O. C. Gilbert (trading as C. Gilbert & Son), electrical and radio engineer, 14a, Shouldham Street, Edgware Road, W.1.—At the meeting of creditors held on February 15th no statement of affairs was presented, but the accountants reported that the liabilities amounted to £1,448, while the net assets were £511, leaving a deficiency of £937. No offer of a composition was submitted, but it was stated that the debtor wished to continue the business and would endeavour to find guarantors for the payment of a composition. It was decided that a deed of assignment should be executed to Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, as trustee, with a committee of inspection.

Mrs. S. Barnard (trading as Philip Barnard & Co.), wireless and electrical goods dealer, 42, Maiden Lane, W.C.—The creditors met recently at the debtor's premises, when a statement of affairs was submitted which showed ranking liabilities of £2,587 and net assets of £357, leaving a deficiency of £2,230. An offer of a composition of 4s. in the £, payable by two equal guaranteed instalments at one and three months, was accepted.

A. J. Rudd (trading as "Esco Co."), wireless factors, St. Peter's Hall, Norwich.—Liabilities of £3,781 were disclosed at a recent meeting of creditors, the assets being stated at £3,804, thus disclosing a surplus of £23. It was stated that the debtor had been doing a certain amount of easy payment business, and the assets included book debts estimated to produce £1,330. It was resolved that the deed of assignment already executed should be confirmed. A committee of inspection was also appointed.

Rose and Partridge, Ltd, electrical accessory factors, 5-8, Finsbury Court, E.C.2.—A meeting of creditors was held on February 24th at the offices of Messrs. Bate & Co., when a statement of affairs which had been prepared by Mr. A. F. C. Boyes, the receiver for the debenture holders, was submitted, which disclosed liabilities of £3,793. The assets were estimated to produce £910, leaving a deficiency so far as the debenture holders were concerned of £1,090. The meeting terminated without any resolutions being passed.

Electricity Supply

Lighting, Domestic, Power

Amble (Northumberland).—EXTENSIONS.—The Urban District Council is to extend mains to give a supply of electricity to the Coastguard Station, Cliff House, and to houses in course of construction on land north of the Link Estate.

Basingstoke.—SUPPLY TO SOUTH HAM.—The Town Council has decided to provide distribution and public lighting mains, together with lamps, at the new housing site at South Ham, at an estimated cost of £750, excluding meters.

Bexhill.—MAINS AND SERVICES.—The Electricity Committee is to apply for sanction to the borrowing of £5,000 for mains and services.

Birkenhead.—EXTENSIONS.—The Electricity Committee has obtained sanction to a loan of £9,562 for mains extensions, and is to provide new lines on existing poles at Upton at a cost of £500 to remedy complaints regarding low pressure.

CORPORATION WIRING CONTRACTS.—The electrical engineer has been instructed to inform certain firms of wiring contractors that unless they each engage one apprentice of the Electricity Department they will not in future be invited to tender.

STREET LIGHTING IMPROVEMENTS.—The Watch Committee recommends a scheme prepared by the electrical engineer for the improvement of street lighting in Borough Road and Argyle Street at a cost of £1,160.

Birmingham.—ELECTRICITY'S CONTINUED PROGRESS.—At the next meeting of the City Council the Electric Supply Committee is to ask for approval to an expenditure of about £750,000, of which £550,000 is for developments in connection with anticipation of increased demands. Notwithstanding the industrial depression, requirements continue to expand at a rapid rate, and the Committee states that it feels justified in freely developing the resources of the undertaking in view of the revenue-producing nature of the expenditure. Compared with three years ago the Department has 530 more employés in its service, and its contractors have 650 men engaged on mains work; the work proposed would have the effect of bringing that number up to about 1,000, and, incidentally, the proposal would do much to further the Lord Mayor's scheme for relieving unemployment. It is reported that a further 1,163 new consumers were connected in January, and, during the past three years over 50,000 premises were given supplies, calling for a capital expenditure of approximately £360,000 a year to deal with the increased load. A sum of £200,000 of the £750,000 will be required for constructional work to deal with the grit nuisance from the chimneys at the Nechells and Hams Hall stations. The Electricity Department has already fitted cyclone collectors to the chimneys, but with pulverised fuel this is not sufficient, and as a result of investigations Mr. F. Forrest (city electrical engineer) has recommended the installation of electro-filters at the two stations. These will be combined with new high brick chimneys, which are to replace the present steel chimneys. The new chimneys will be about 350 ft. high and 20 ft. in diameter at the top.

Bognor Regis.—BULK SUPPLY FROM CHICHESTER.—After long negotiations and arbitration the Bognor Gas & Electricity Co. has agreed to accept a reduction of prices in the 1928 contract of from £4 5s. per kVA per annum plus 0.54d. per kWh to £4 2s. 6d. per kVA plus 0.54d. per kWh for the first million kWh, 0.48d. per annum for the second million, 0.34d. for the third million kWh, and 0.33d. beyond.

Bolton.—SUPPLY TO DUNSCAR DISTRICT.—The Electricity Committee is to consider the provision of a supply to the Dunscar district.

Bournemouth.—CHANGE OF FREQUENCY.—The Bournemouth and Poole Electricity Supply Co., Ltd., proposes to change the frequency of supply throughout the Wimborne area from 100 to 50 cycles. The company will carry out any necessary alterations to the existing apparatus of consumers at its own expense.

Darlington.—REBATE ON ACCOUNTS.—The Electricity Committee has decided to give a 20 per cent. rebate on all electricity accounts for the current quarter. A rebate of 10 per cent. was made on the December accounts, so that in six months Darlington consumers of electricity will have received nearly £9,000 in discounts.

Dundee.—THE CAROLINA PORT STATION.—The Electricity Committee recommends that the Central Electricity Board should take over the Corporation generating station at Carolina Port, with the proviso that the Board shall operate the station for the same number of hours as it was operated during the past year, and that the station shall always be kept under steam. For the past fifteen months the supply has been provided jointly by the generating station and the grid. It was stated that from fifteen to twenty men would be discharged from the station, but within a short time the engineer hoped to be able to absorb a number of them into the distribution side.

Glossop.—ELECTRICITY CHARGES.—The Corporation is to ask the Electricity Commissioners to consider the prices and methods of charging for electricity in the borough with a view to making an order for the reduction of the present price of 8d. per kWh.

Greenock.—PROGRESS OF THE GRID.—At a recent meeting of the Corporation Provost Drummond stated that in the Central Scotland area the Central Electricity Board had made such progress with its work that it had been enabled to apply the two-part tariff to all undertakings in the area. So far as Greenock was concerned this tariff would be very beneficial.

Hull.—WIRING INSTALLATION.—The Electricity Committee has obtained sanction to the borrowing of £25,000 for wiring installations.

Ipswich.—DE-AERATING PLANT.—The installation of new de-aerating plant costing £895 is recommended by the Electricity Committee.

Keighley.—OFFER TO PURCHASE UNDERTAKING.—An offer to purchase the Corporation electricity undertaking has been made by a company. The Electricity Committee recommends that the offer should be rejected.

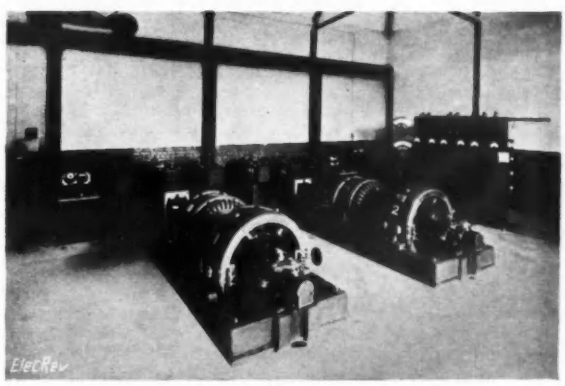
MAINS EXTENSIONS.—Mains extensions are to be carried out at a cost of £200 to supply Morton Banks.

Keswick.—AN "ANTI-PYLON" COMMITTEE.—The body of Lakeland residents who some time ago formed the Keswick Anti-Pylon Committee to oppose the erection of pylons and overhead lines have decided to pursue a constructive policy in future with the object of securing a cheap and plentiful supply of electricity in the Lake District with the least possible damage to amenities. The Committee will in future be known as the Lake District Counties Electricity Committee, and in a statement it is announced that the Committee is fully prepared to offer the stoutest resistance to any revival of pylon and overhead-line schemes.

Liverpool.—PURCHASE OF PRESCOT UNDERTAKING RECOMMENDED.—The Electric Power and Lighting Committee recommends the purchase of the electricity undertaking of the British Insulated Cables, Ltd., Prescot, as a going concern, on the terms set out in a letter from the company's managing director.

Llandrindod Wells.—PROPOSED TRANSFER OF UNDERTAKING.—With reference to the proposed disposal of the electricity undertaking to the Shropshire, Worcestershire and Staffordshire Electric Power Co., Mr. Burr, the Urban District Council's consulting electrical engineer, has stated that he considers the undertaking to be worth the outstanding capital of £20,329, plus £11,256, and he advises that the company should be pressed to increase its offer. A deputation has been appointed to meet the company's representatives on the matter.

London.—STEPNEY.—The Electricity Supply Committee recommends that accounts for electricity should be rendered quarterly instead of monthly and that prepayment meter supplies should be charged for as follows "pending the introduction of a successful double-tariff prepayment meter":—(*a*) Assisted wiring consumers, 4½d. per kWh up to a certain quantity to be decided upon by the Council, and 3¼d. per kWh beyond; (*b*) ordinary consumers, 3d. per kWh.



Bruce Peebles motor convertors starting afresh in the new Northern sub-station, Stoke Newington, after twenty-seven years' service

STOKE NEWINGTON.—The Electricity Committee proposes to apply for sanction to a further loan of £5,000 for free wiring installations. It is recommended that in future all calculations of the primary charges under scale "G" (combined lighting and domestic scale for private residences) should be made on the basis of 1s. 6d. per quarter for every lampholder installed and that one lampholder be reckoned for every room which is furnished but not wired. The "unit" charge under this tariff is ¾d.

The formal opening last Saturday of the new Northern sub-station represents the completion of electrical extensions decided upon by the Council in 1929. After the chairman of the Electricity Committee, Councillor P. R. Crane, had spoken of the need for the new station, the Mayor, Sir Herbert J. Ormond, outlined the progress made by the undertaking, and the Mayoress formally opened the station. Two 120-kW convertors in the new station have been transferred from the Edwards Lane station where they were installed in 1906.

They have been in use ever since, and it is a tribute to the manufacturers, Messrs. Bruce, Peebles & Co., Ltd., that after overhauling they were in fit condition to be put into the new station; Ferranti transformers of a similar age have also been overhauled and returned to service.

FINSBURY.—Electricity is to be substituted for gas lighting in the principal streets at a cost of £10,839, and 387 new standards are to be installed in twenty-seven thoroughfares. It is not proposed to raise a loan for the scheme as arrangements have been made with the County of London Electric Supply Co., Ltd., for payment to be spread over ten years. The Council estimates that the scheme will not only provide better lighting but effect a saving of £1,500 a year.

ST. MARYLEBONE.—A sum of £468 is to be spent on installing rising mains at 68-74, Edgware Road.

HAMMERSMITH.—The Electricity Committee reports that preliminary notification has been received from the London and Home Counties Joint Electricity Authority that the Council's generating station may be required to close down during the summer and autumn of this year and to be operated on one shift only during the winter and spring of 1933-34. The Committee is negotiating with the Joint Electricity Authority on the matter.

POPLAR.—The Electricity Committee has revised its scheme for the hire-purchase of electrical apparatus. It is proposed that 2½ per cent. per annum should be added to the list price of apparatus let out on the hire-purchase system in order to cover interest charges and that the period of hire-purchase be limited to three years instead of ten. The purchaser is to pay 12½ per cent. of the cost of the apparatus on signing the agreement and the balance by monthly instalments. In the case of wiring and the fixing of apparatus the 2½ per cent. per annum will be added to the usual 20 per cent. establishment charges on the cost of the work.

E.h.p. switchgear is to be provided at the Glengall Road and Farm Gate sub-stations at a cost of £3,150.

WESTMINSTER.—The City Council Assessment Committee reports that the appeals by the six electricity supply companies against the assessments of their undertakings involve a special point arising under the London Electricity (No. 2) Act, 1925, which is common to a number of electricity undertakings in London, and it was accordingly arranged between the parties that the appeal of the St. James' and Pall Mall Electric Light Co., Ltd., should be taken as a test case for decision by the High Court. The question to be decided by the test case is one which affects the assessments of electricity undertakings not only during the present quinquennial period but until the undertakings are taken over by the Joint Electricity Authority in 1971. If the case is decided in the company's favour, the total rateable value in Westminster of the electricity undertakings concerned will be reduced by approximately £44,000. A Divisional Court gave a decision in favour of the company; the Committee appealed against this decision and the Court of Appeal reversed the decision of the Divisional Court. The company intends to appeal to the House of Lords, and the Committee is arranging to defend the appeal and is asking the other assessment committees concerned to continue to co-operate in the case.

NORTHMET CO.'S REDUCED CHARGES.—As foreshadowed in Lord Ashfield's speech at the recent annual general meeting of the North Metropolitan Electric Power Supply Co., reductions in charges for electricity are to be introduced in the following districts. Only the lighting flat rate reduction is shown, but corresponding reductions are also to be made in the domestic contract and other rates:—Barnet, East Barnet Valley, Enfield and Friern Barnet, from 5d. to 4½d. per kWh; Chingford and Stanmore, from 5½d. to 4½d.; Totteridge, from 6d. to 5d.; Cheshunt, Cuffley, Goffs Oak, Upshire, Sewardstone, Waltham Abbey, Elstree, Boreham Wood, Hertford, Hoddeston, Broxbourne, Ware, Brookmans Park, Northaw, Potters Bar and South Mimms, from 7d. to 6d. In addition, there are a number of small villages in rural districts at present being charged lighting flat rates of 8d. and 9d. per kWh; these will all be reduced to 7d. so that the maximum rate throughout the whole of the Northmet district, including the large and sparsely populated rural part of the area, will be 7d. per kWh. Another effect of the reductions will be that the "unit" charge on the contract (two-part) rate will be the same throughout the area, viz., ½d. in the summer and 1d. in the winter. Approximately 30,000 consumers will benefit by these reductions.

HAMPSTEAD.—The Town Council has decided to reduce the flat rate for cooking, heating and power from 0.75d. to 0.6d. per kWh.

Machynlleth (Mont).—SUPPLY INAUGURATED.—A supply of electricity provided by the local electricity company was inaugurated on February 20th.

Penrith.—THE ELECTRICITY SCHEME.—The electricity scheme for the district was considered at a meeting of the Rural District Council. It was reported that the period of two years from the date of the commencement of the Mid-Cumberland Electricity Order expired on August 7th, 1932, and therefore the undertakers (Electrical Distribution of Yorkshire, Ltd.) were in default in not having laid down suitable and sufficient mains for the purpose of general supplies to the parishes of Edenhall, Great Salkeld, Greystoke, Langwathy, and Lazonby. The Council is to ask the undertakers to proceed with the work, and point out to them that the Order prescribes that mains are to be laid down for the purpose of a general supply in parts of the parishes of Dacre, Hesket-in-the-Forest, Newton, Skelton, and Threlkeld by August next.

Perth.—BULK SUPPLY AGREEMENT.—Approval has been given to an agreement between the Grampian Electricity Supply Co. and the Town Council for the provision of a bulk supply of electricity to the town. The agreement provides for the transfer from the Council to the company of the lands, buildings, plant and machinery of the power station at the Shore (other than the distribution plant and machinery) on May 15th next, and the company is to pay the Council £38,000, which is more than the whole outstanding debt on the generating station and plant. The agreement is for the term of twenty years, and the cost of electricity to the consumers is not to be more than at present. After May 15th the Council will act as distributors only.

Plymouth.—CHEAPER ELECTRICITY.—The "unit" charge of the all-in tariff has been reduced from ¾d. to ½d. The discount on the ordinary lighting rate is also increased from 5 to 10 per cent. and a special rate of 2d. per kWh, less 10 per cent. discount, has been fixed for late shop-window lighting.

Ripon.—RURAL ELECTRIFICATION.—The Burnley and Morpeth Rural District Councils have agreed to support a resolution passed by the Ripon Rural District Council urging the Central Electricity Board to seek powers to control the installation and distribution of electricity to consumers in rural areas and thus obtain a greater utilisation of electricity through a greatly reduced cost per kWh to the consumers in those areas.

St. Austell.—OVERHEAD LINE INQUIRY.—Mr. F. Gordon Tucker held a Ministry of Transport inquiry last week into the application of the St. Austell Electric Lighting & Power Co., Ltd., for permission to erect overhead lines to supply Pentewan and Mevagissey. There was opposition on the part of the Cornwall County Council, the St. Austell Urban and Rural District Councils, and the Cornwall branch of the Council for the Preservation of Rural England.

Sheffield—MAINS EXTENSIONS.—The Electricity Committee is to extend mains at an estimated cost of £11,059.

Southend-on-Sea.—EXTENSIONS.—Mains extensions are to be carried out in five thoroughfares at a cost of £1,190, and application has been made for sanction to a loan of £3,796 for equipment for five transformer stations.

THE AUTUMN ILLUMINATIONS.—The Electricity Committee has been authorised to proceed with a scheme of illuminations on the Marine Parade, the Lower Esplanade, the Cliffs, Westcliff Parade, the Pier, and the Shrubbery at an annual cost of £6,000, the Committee to contribute 30 per cent. of that sum. As an initial expenditure on the illuminations a sum of £12,000 is to be provided.

Stoke-on-Trent.—EXTENSIONS.—The Electricity Committee has decided to install an additional transformer at Lichfield Street sub-station, Hanley, at a cost of £500, and sanction has been received to loans of £400 for mains and £300 for plant in connection with a supply to Florence Colliery, Longton.

STREET LIGHTING IMPROVEMENTS.—Improvements in street lighting are to be carried out at an estimated cost of £320.

Surrey.—CHEAPER ELECTRICITY.—Considerable reductions in charges for electricity in certain areas served by the County of London Electric Supply Co., Ltd., are to be announced shortly. The districts affected include Purley, Coulsdon, Wallington, Epsom, Chipstead, Beddingham, Mitcham and Merstham.

Sutton Coldfield.—EXTENSIONS.—The Electricity Committee is to extend mains at a cost of £218 to supply houses in Streetly, and proposes to provide an additional switch panel to the h.p. switchboard at Wylde Green sub-station costing £145.

Swansea.—THE TIR JOHN NORTH STATION.—It has been decided to lay the foundation stone of the new Tir John North power station on or about May 11th, and Sir Andrew Duncan, chairman of the Central Electricity Board, is to be invited to perform the ceremony.

Watford.—CHEAPER ELECTRICITY.—The Corporation has approved the following reductions in charges of electricity in the borough of Watford and the parishes of Abbots Langley and Bushey:—Lighting flat rate, first 30 kWh in each of the winter quarters and the first 10 kWh in each of the summer quarters, 4½d. per kWh (old charge 5d. per kWh); all energy above that amount 2½d. (2¾d.). Lighting two-rate system, all energy registered on high-rate meter charged at the above lighting flat rate, electricity registered on the low-rate meter being charged for at the power and heating scale below. Prepayment meter lighting, 5½d. (6½d.). Norwich system, fixed charge unchanged, but "unit" charge reduced from ¼d. to ⅛d. in the summer, and from 0.45d. to ⅜d. in the winter. Outside shop lighting, 1½d. (2½d.) Special heating rate, first 500 kWh a quarter, 1d.; next 500 kWh, ¾d.; above, ½d. Power and heating up to 1,500 kWh a quarter, 1¼d.; up to 3,000 kWh 1⅛d.; up to 4,000 kWh, 1d.; up to 16,000 kWh, ⅞d.; above 16,000 kWh, ¾d.; special quotations for larger quantities.

Wealdstone.—ELECTRICITY FOR HOUSING ESTATES.—The Housing Committee recommends the acceptance of the terms of the North Metropolitan Electric Power Supply Co. of 1s. 1½d. per week for a limited supply for 316 houses. The sub-services are to be carried out by the company at the cost of £518.

Traction

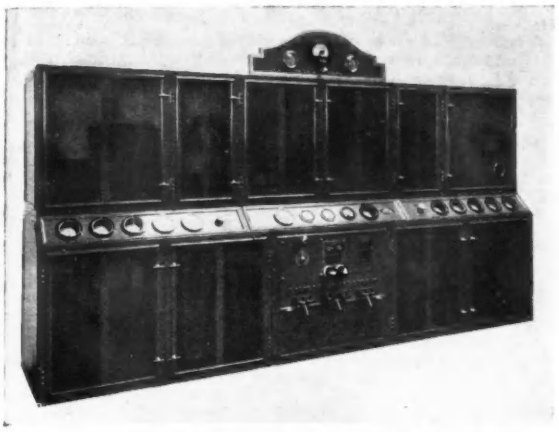
Bexhill.—AUTOMATIC TRAFFIC SIGNALS.—The Highways Committee recommends the installation of automatic traffic signals at a cost of £250.

Birkenhead.—TRAFFIC CONTROL.—The Watch Committee recommends the installation of automatic traffic signals costing £4,526.

Blackpool.—NEW TRAMCAR DESIGN.—A new type of tramcar, streamlined and quick loading, has been designed by Mr. W. Luff, Blackpool's new transport manager. Mr. Luff has submitted a model to his Committee, and he has been asked to prepare further details with probable cost, &c.

Cleethorpes.—COUNCIL OFFERS TO BUY TRAMS.—The Urban District Council has asked the tramway company upon what terms it will sell its undertaking to the Council.

Germany.—RAILWAY ELECTRIFICATION.—The German State Railway has completed the electrification on the 11,000-V single-phase a.c. system of a 25-mile line from Herschberg to



A Marconi self-contained all-mains broadcast transmitter designed particularly for relaying programmes carried by land line. Its aerial carrier wave energy is 250 W

Landshut, in Bavaria, which will be operated by electric motor-coaches hauling trailers. This brings the total electrified mileage in Germany up to 1,025.

Ilford.—TUBE EXTENSION PETITION.—A petition from the Ilford and District Railway Users' Association is being presented to the Minister of Transport proposing the extension of the Central London Tube to Ilford and Romford.

Ipswich.—PURCHASE OF TROLLEY-BUSES.—The Transport Committee recommends the purchase of four trolley-buses at an estimated cost of £1,750 each. The Committee points out that the present trade depression is having an adverse effect on the financial position of the transport undertaking, and it is only with a view to providing work that it puts forward the recommendation.

Leigh.—TROLLEY-BUSES TO REPLACE TRAMS.—The South Lancashire Transport Co. has decided to convert its tramways from Leigh Four Lane Ends, Bolton, to the trolley-bus system.

L.N.E. Railway.—ELECTRO-MAGNETIC RAIL BRAKES.—The new "down" marshalling yard at March, Cambridgeshire, has now been completed, and this, with the new "up" yard opened four years ago, constitutes the largest and most up-to-date marshalling yard in the country. This yard, says *The Times*, is the only one in this country in which the control of the movement of wagons is exercised by power-operated retarders combined with an elaborate system of power-operated points and track circuits. The train to be sorted is pushed over a hump, and as they run down the wagons pass over retarding brakes so regulated from a central control tower that they are allowed only sufficient impetus to carry them to their appropriate position in the marshalling sidings. The control of the movement of the wagons in the "up" yard was exercised by Froelich hydraulic rail brakes, but since that yard was opened the Westinghouse Brake & Saxby Signal Co. has introduced electro-magnetic rail brakes, and these are employed for the first time in this country in the "down" yard.

Middlesbrough.—OPPOSITION TO BILL.—The County Council has petitioned against the Middlesbrough Corporation's Bill respecting the local transport facilities. Among other things the Bill seeks powers to run services of trolley-buses on various roads between the Tees (Newport) Bridge and the Transporter Bridge, with powers to run over the Tees (Newport) Bridge when it is completed.

Morocco.—A STEP NEARER ELECTRIFICATION.—According to a *Reuter* message, the first portion of the El Kansera dam on the Ould Beth in North Morocco is likely to be completed in April. The whole dam should be finished next year, and it will impound about 230 million cu. m. of water, which will be available for the electrification of the North Morocco Railway. The estimated cost of the dam is roughly 110 million francs.

Sweden.—RAILWAY ELECTRIFICATION.—The State Railway administration has completed the inquiry asked for by the Government, and recommends the immediate putting in hand of the work for the electrification of the West Coast Railway. The total outlay is estimated at 27,250,000 kr. and the work is to be completed in 1936.

Communications

Belgium.—BROADCASTING CONFERENCE.—The International Broadcasting Union, which has been meeting at Brussels, has concluded its labours and has forwarded to the Swiss Government a scheme for a new allotment of wavelengths. The scheme will be distributed by the Swiss Government to the postal administrations of Europe, for their comments and observations, in view of the European broadcasting conference which is to be held at Lucerne before the beginning of June. Before the conference concluded the Australian Radio Commission was admitted as an associate member of the Union and the Latvian Broadcasting Company as an active member. Advantage was taken of the meeting to discuss a number of matters relating to broadcasting, apart from the question of wavelengths.—*Reuter* (Brussels).

Birmingham.—RADIO INTERFERENCE.—The total number of wireless interference cases dealt with in the Birmingham telephone area during the last twelve months was 1,425. Of these 1,066 were traced to electrical interference from various sources (e.g., printing works, dental mechanics' apparatus, advertisement flashing signs, heat-ray equipment, &c.), and 285 to oscillation interference from neighbouring receivers. In addition, 150 miscellaneous cases have been dealt with, including the inspection of amateur transmitting stations, the location of illicit transmitters, and the investigation of alleged tramway interference. The Birmingham direction-finding van has been used in the majority of these cases. The van has also been extensively used in connection with the recent intensive wireless licence campaign, and this has no doubt contributed substantially to the increase of 32,000 in the number of licences issued in Birmingham during 1932. There is every indication that the figures quoted will be considerably exceeded this year.

Great Britain.—RADIO RELAY EXCHANGES.—The Highways Committee of the Berkshire County Council reports that the Maidenhead Radio Service, Ltd., has established a relay service in Maidenhead and has applied for consent to carry service wires over county roads.

The Poplar Highways Committee, reporting on the London Overground Wires, etc., Bill, states that there is a possibility that broadcast relay service companies operating in London may combine to oppose the Bill, and in this connection there is an increasing need for preserving, for public safety, the free accessibility of the highways to traffic generally, and for securing freedom therein for the proper exercise of fire rescue

The opening of the "Advance" exchange. **(See page 306)**
From left to right: Mr. E. Gomersall, superintending engineer, London District, Major C. R. Attlee, M.P., and Mr. W. H. U. Napier, controller, London Telephone Service

and extinguishing measures in particular, as well as safeguarding persons working upon the roofs of buildings, and these appear to be very cogent reasons for maintaining the present restrictions as the Bill purports to do.

Poland.—AUTOMATIC TELEPHONY.—Operations have recently been commenced on the conversion of the manually operated telephone system to automatic working. The first work to be put in hand is the establishment of automatic exchanges in Katowice and Krolewska Huta. The conversion of the exchange in Warsaw is approaching completion, while, later, automatic exchanges are to be established in Gdynia, Czestochowa, Cieszyu, Brzesc, Torun, Grudziadz, Tczew, and Kielce.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Alderley Edge & Wilmslow.—Electricity Board. Electrical stores. (February 24th.)

Cardiff.—March 20th. Electricity Department. E.h.p. and l.p. overhead lines and pole-mounting transformer and switchgear at Peterston-super-Ely. (February 24th.)

Carlisle.—March 15th. Electricity Department. Transformers. (See this issue.)

Darlington.—Town Council. Rewiring of the fire station. Chief officer, Fire Brigade.

Dumfries.—County Council. 33- and 11-kV air break switchgear. (February 24th.)

East Sussex.—March 13th. Public Assistance Committee. Electric lamps for six months for eleven institutions. P.A. Officer, West Street, Lewes (tender forms 1s. per copy).

Edinburgh.—March 9th. Electricity Department. Electrical stores. (February 17th.)

Erith.—March 7th. Electricity Department. Cables, meters, joint-boxes, &c. (February 24th.)

Farnworth.—March 11th. Electricity Department. L p. cables and disconnecting feeder pillar. (See this issue.)

Fife.—March 6th. County Council. Various works, including electric lighting at twenty houses at North Queensferry. Mr. J. T. Scobie, architect, 1, Douglas Street, Dunfermline.

Grays Thurrock.—March 8th. Electricity Department. Installation work in connection with assisted wiring scheme. (February 24th.)

Hastings.—March 7th. Electricity Department. Power station and sub-station switchgear. Also two 3,000-kVA transformers. (February 24th.)

Hull.—March 21st. Electricity Department. (*a*) Static transformers, lamp posts, and brackets; and (*b*) time switches. (See this issue.)

London.—HACKNEY.—March 8th. Electricity Department. Electric meters and demand indicators. Also installation cables and flexible cords. (February 24th.)

Manchester.—March 8th. Electricity Department. Two 2,000-kVA static transformers for Barton power station. (February 24th.)

Marple.—March 11th. Gas and Electricity Department. (*a*) Filling compound for electrical apparatus, and (*b*) ducts. Electricity manager, Gas Works, Marple Bridge, near Stockport.

Northern Ireland.—April 3rd. Electricity Board. L.p. distribution systems. (See this issue.)

Prestwich.—March 11th. Urban District Council. Electric lamps. U.D.C. surveyor, Town Hall.

Rhondda.—March 25th. Electricity Department. Meters, copper wire, joint boxes, &c. (February 17th.)

Royton.—March 9th. Urban District Council. Electric lamps. U.D.C. surveyor, Town Hall.

Salford.—March 6th. Electricity Department. 6,600-V metal-clad sub-station switchgear and l.p. fuse gear. (February 24th.)

Sevenoaks.—March 15th. Rural District Council. Installation of electricity at Isolation Hospital at Otford. (February 24th.)

South Africa.—CAPE TOWN.—March 15th. Electricity Department. Metal-clad switch and fuse boards for domestic purposes. (A.X. 11697.)*

March 29th. Overhead line equipment, including street-lighting fittings (G.X. 12336)*; 1,000 tubular steel poles and fittings (G.X. 12339)*; and ironclad service cut-outs (A.X. 11710).*

Stoke-on-Trent.—March 8th. Electricity Department. A.c meters, mains and cables, and overhead lines. (February 24th.)

Willesden.—Electricity Department. Cables. (February 24th.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Birkenhead.—Electricity Committee. Accepted. Wiring Council houses: Eighteen at £91.—L. W. Bryan; thirteen at £64.—Economic Electric Co.; twenty-two at £108.—S. George; four at £22.—J. McKenzie; seven at £31.—Park Electric Co.; ninety at £448.—J. J. Peters; forty-eight at £247.—G. W. Roberts; forty-five at £235.—Trace & Son. Transformers (£504). —Fuller Electrical & Manufacturing Co., Ltd. Cables (£204).—Derby Cables, Ltd.

Durham.—County Public Assistance Committee. Accepted. Electrical refrigerator (£169).—Electricals, Ltd.

Hamilton.—Streets Committee. Recommended. Automatic traffic control signals at Old Cross (£665), New Cross (£483), and Peacock Cross (£544).—Automatic Electric Co., Ltd.

Hornsey.—Electricity Committee. Recommended. 800-kW rectifier at Highgate sub-station (£3,000).—Hewittic Electric Co., Ltd.

Hull.—Baths Committee. Accepted. Electrical installation at Albert Avenue baths (£1,076).—Napier & Wheeldon.

Telephones Committee. Recommended. Composite cable (£703).—Power & Lighting Cables, Ltd. Bronze wire (£211).—F. Smith & Co. Lead-in wires (£88).—Macintosh Cable Co., Ltd.

Electricity Committee. Recommended. Re-blading two turbo-alternators (£12,600).—Brush Electrical Engineering Co., Ltd. Two batteries (£1,068).—Tudor Accumulator Co., Ltd.

Water Committee. Accepted. Electric lighting at Springhead pumping station (£231).—Domestic & Commercial Electricity (Hull), Ltd.

Morecambe.—Electricity Committee. Accepted. Switchgear for Woodhall Lane station.—General Electric Co., Ltd.

Salford.—Electricity Committee. Recommended. Circuit-breaker alterations (£482).—Ferguson, Pailin, Ltd. Switchgear extensions and alterations, West Street station (£174).—Metropolitan-Vickers Electrical Co., Ltd.

Smethwick.—Gas Committee. Accepted. Feed water regulators in connection with the electric generating plant at the gasworks (£108).—Cope's Regulators, Ltd.

Southend-on-Sea.—Town Council. Accepted. Repairing electric lighting installation at sanatorium.—Long & Carter. Electrical illuminations, Cliffs bandstand and shelters (£850).—F. P. Richard & Co. Apparatus for sewage works (£680).—General Electric Co., Ltd. Change-over of apparatus from d.c. to a.c., Kursaal area (£227).—F. P. Richard & Co.

Stoke-on-Trent.—Electricity Committee. Accepted. Overhead wiring and services, Uttoxeter Road, Longton (£987).—E. Holloway.

Housing Committee. Accepted. Wiring work and fittings for forty-six houses on Meir Estate.—Hawley Ingram & Co.

Forthcoming Events

Physical Society.—Friday, March 3rd. Lecture Theatre, Western Electric Co., Ltd., Bush House, W.C. 5 p.m. Demonstration of an artificial larynx by Major G. Jacques, and films by the company relating to sound recording or allied subjects.

Institution of Production Engineers.—Friday, March 3rd. Society of Motor Manufacturers and Traders, Pall Mall, S.W. 7.30 p.m. "Standardisation." Mr. C. le Maistre.

Royal Society of Arts.—Wednesday, March 8th. John Street, Adelphi, W.C. 8 p.m. "Recent Developments in the Warming and Ventilation of Buildings." Mr. J. L. Musgrave.

Institute of Metals.—March 8th-9th. London. Annual meeting. March 8th. Annual dinner.

Institution of Electrical Engineers.—Thursday, March 9th. Institution, London. 6 p.m. "Ionisation in Cable Dielectrics" Mr. P. Dunsheath. (*Western Centre*).—Friday, March 3rd. Corn Exchange, Gloucester. 7.30 p.m. Faraday Lecture, "Lightning—and how the Engineer deals with its Effects." Prof. J. T. MacGregor-Morris. (*Meter and Instrument Section*). —Friday, March 3rd. Institution, London. 7 p.m. "An Improved 3-phase, 3-wire, Volt Ah Meter." Mr. G. A. Cheetham. "A Method of Testing Reactive Volt Ah Meters." Mr. R. S. J. Spilsbury. (*London Students' Section*).—Saturday, March 4th. 2.30 p.m. Visit to the N.P.L., Teddington. Friday, March 10th. Institution, London. 6.15 p.m. "Turbo-Electric Marine Propulsion." Mr. H. W. Beara. (*North Midland Centre*).—Tuesday, March 7th. Hotel Metropole, Leeds. 7 p.m. "The Present Practical Limits of Power Station Efficiency." Mr. W. S. Burge. Friday, March 10th. Hotel Metropole. 7 for 7.30 p.m. Annual dinner. (*South Midland Centre*).—Tuesday, March 7th. Central Technical College, Birmingham. 7 p.m. Joint meeting with I.C.E. and I.Mech.E. Faraday lecture. Prof. J. T. MacGregor-Morris. (*North-Western Students' Section*).—Tuesday, March 7th. Engineers' Club, Manchester. 7.15 p.m. "Application of Electric Drive to Rolling Mills." Mr. R. P. Horlock. (*Hampshire Sub-Centre*).—Wednesday, March 8th. Municipal College, Portsmouth. 7.30 p.m. Short papers. (*North-Eastern Students' Section*).—Friday, March 10th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. "The Design and Economics of Transformers for Rural Electrification." Mr. E. C. Rippon.

Birmingham Electric Club.—Friday, March 10th. Grand Hotel, Birmingham. 7 p.m. Annual dinner.

A High-frequency Arc Welding Generator

THE advantages of a high-frequency induction generator for metal arc welding were described at the A.I.E.E. winter convention, New York. The generator is of the double-core type operating at 3,600 r.p.m. with welding currents at a frequency of 900 cycles; the rotor teeth or poles are laminated. The relatively high speed permits direct coupling to petrol engines to form light and compact portable sets.

Self-excitation is obtained through a bridge-connected full-wave rectifier. This generator circuit occupies three of the sixty stator teeth, the d.c. field circuit being a single coil. The two stator windings are divided into ten independent welding circuits, with the same characteristics, none of which is affected by the current in any other; individual coils embrace only one pole. Switching can be arranged so that there may be as many operators as there are circuits, or the circuits can be combined to give greater current capacity to fewer operators. No external reactance or resistance is used, and the switches afford all the control necessary and, being marked either in amperes or kWh, indicate almost exactly the value of the current available for a certain setting.

Metal arcs are easy to strike and hold at from 65 to 70 V. Arcs of the smallest current values can be held successfully with open-circuit voltages below 100. The penetration obtained with metal arcs is said to be particularly good where new heavy-coated rods are used and in other work where reversed d.c. polarity is recommended. Other advantages claimed are freedom from transients that affect the welding operation, high efficiency; rugged construction of the rotor, which has no windings, commutator, or brush wear; even phase loading of three-phase lines; and a weight and cost less than half those of the usual d.c. machine.

Notes

What Is This?

An announcement of an "Electricity Consumers' Protection Association" appears in the *Saturday Review*, its aims and objects being stated as follows:—

1.—To watch carefully the developments of the Joint Electricity Authority.

2.—To urge municipalities to secure protection before handing over their rights to an untried bureaucracy.

3.—To interest elected representatives and to avoid hurried surrender of Local Authorities' existing rights.

4.—To investigate and to advise members on all questions of electricity services and charges.

At the foot of the form on which application for membership of the "E.C.P.S." has to be made the following name appears: W. H. Ashbee, 3, Bloomsbury Street, W.C.1. The applicant agrees to contribute the sum of one shilling per annum towards the Society's funds! The authority referred to is the London and Home Counties J.E.A.

Two E.P.E.A. Dinners

Last week's blizzard caused a depleted attendance at the annual dinner at Swansea on Saturday evening last of the West Wales Section of the Electrical Power Engineers' Association. The chair was taken by Mr. H. O. Davies (Swansea Electricity Department), chairman of the section.

"The Association" was proposed by Mr. Burr, who said that power engineers of the future would have to be specialists if they were to succeed. The future for young men, he thought, lay in salesmanship. The potentiality of the industrial load was simply tremendous.

Responding, Mr. Cooper urged that the Association asked for service in return for the salaries paid in the industry. No power engineer, unless he had a post in a super-station, could now feel sure of his position. Still this should have no terrors for the young engineer, for he thought it was a good thing that they should shift about and get experience. Displacement committees had been formed to work on standardised lines, and the Association had established a sound unemployment fund.

Councillor Thomas James proposed the "Electricity Supply Industry" and Mr. Walter Riches responded; "The Chairman" was proposed by Mr. A. Rees, and "The Visitors," proposed from the chair, was acknowledged by Mr. Scott Harrison. During the evening Mr. Griff Charles, baritone, and Col. Sinclair added harmony to the proceedings.

The annual dinner and dance of the Devon and Cornwall Section of the Electrical Power Engineers' Association, was held at the Imperial Hotel, Exeter, on February 18th, Mr. R. Ferguson (Newton Abbot), chairman of the Section, presiding. About 130 members and friends attended, amongst whom were the president of the Association, Mr. D. J. Duffy; Mr. A. L. Keet (Exeter city electrical engineer), and Mrs. Keet; Major A. E. Brock (chairman of Exeter Electricity Committee) and Mrs. Brock, and representatives of manufacturing firms and contractors.

Appointments Vacant

Mathematics master for Wimbledon Technical College.

Resident deputy electrical engineer for Stepney Electricity Department.

Assistant borough electrical engineer and also temporary constructional engineer for Fulham Electricity Department.

Divisional electrical engineer in Chief Engineer's Department, London County Council.

(See our classified advertisements.)

French Physical Society's Exhibition

The annual exhibition of the Société Française de Physique is to be held at the Lycée Louis-le-Grand, Paris, from April 21st to 25th next.

Architects and the Grid

On Monday, Sir Andrew Duncan (chairman, C.E.B.) addressed the Architectural Association (Mr. A. B. Knapp-Fisher, president, in the chair), on "The Electric Grid Supply and its Purpose." We refer to some of the salient points in our leader. Sir Andrew also stated that as the North Scotland area contained only 2 per cent. of the population of Great Britain, the construction of the grid there could be postponed until more prosperous times. He said that the operation of selected stations would depend upon the suitability of their sites, and that the object of the Board was to divide the savings obtained between the urban and sparsely populated areas; ultimately there would be one uniform national grid tariff. The recognition by the general public of the value of availability of supply was indicated by the granting of voluntary wayleaves for 3,920 out of 4,000 miles of overhead lines.

Dr. C. H. Merz expressed the view that people would eventually refuse to live in non-electric houses and suggested that architects should take full advantage of the opportunity offered by automatic temperature control and other electrical methods, which would enable them to dispense with chimneys. Sir John Brooke pointed out that operation on a national scale made possible the maximum use of the latest scientific developments. Sir Archibald Page said that the Board was looking after production; hope now rested in the efforts of the distributors. Sir Thos. Purves said that one very good reason for the adoption of a.c., apart from transmission questions, was the absence of electrolysis.

Mr. J. Gloag, as an architect, looked forward to the building of houses with thin walls due to the use of electricity for heating. He considered that the "pylons" would do far more to beautify England than anything else, due to the reduction in smoke they would bring about. The help of the architect in the design of showrooms was requested by Mr. W. J. Jones, Col. T. H. Minshall submitted that the object of the grid was not so much to cheapen electricity immediately as to save money later. Mr. Easton emphasised, from the architectural standpoint, the value of a two-part tariff with a low secondary charge in encouraging adequate lighting. Mr. H. T. Young stated that one shop in Oxford Street used 4½ million kWh per annum (equal to the output of the Canterbury undertaking), three together used eight million (Scarborough), and one only partly electrified hotel used 2¼ million (Dover). Architects should plan the electrical work for at least ten to fifteen years ahead. The engineer without the architect could not adapt electric light to modern needs.

The E.A.W.

The Duchess of York visited the new E.A.W. headquarters and Electrical Housecraft School on February 22nd. Her Royal Highness was received by the president of the Association, Lady Moir, O.B.E., and the director, Miss Caroline Haslett, C.B.E., and was presented with a bouquet by Miss Joy Moir. She then proceeded to inspect the new electrically equipped club room and the Electrical Housecraft School, where all the latest developments of electrical housecraft were explained to her. Among those present were Viscountess Astor, the Lady Mount Temple, Catherine Countess of Westmorland, Dr. E. Sloan Chesser, Dowager Lady Swaythling, Mrs. G. Z. de Ferranti, Councillor Mrs. Gregory, Sir John Snell, Sir Duncan Watson, Sir Hugo and Lady Hirst, Mrs. F. J. Walker, Mrs. H. C. Lamb, Mrs. MacLachlan, Mrs. Arthur Reed, Mrs. Pearce-Ellis, Mrs. Ll. B. Atkinson, and Mrs. Arrol Moir.

The Bradford and District branch of the Electrical Association for Women held its annual luncheon on February 25th. The Lord Mayor of Bradford, proposing the toast of the Association, said that the present high cost of appliances was due to the comparative smallness of the number in use, and if the Association could spread the use of them prices would decrease. Responding to the toast, Miss Haslett suggested that the house of the future must be built with the necessary accommodation in which to put new labour-saving appliances, so that they would not be a nuisance when not in use. Mrs. Kathleen Chambers (vice-president of the branch) presided, and Lady Ramsden was elected president.

Electrically Heated Tar Boilers

One great drawback to the tar boilers which have been in use for many years in connection with road re-surfacing work is the smoke they give off. In order to overcome this difficulty the Eliva Gesellschaft, of Munich, has recently introduced a series of electrically heated tar boilers in capacities ranging from 44 to 132 gallons. The boilers are heated by externally fitted elements and are stated to require from 10 to 40 kW at from 500 to 700 V.

The N.E.S.C.O.E. Dinner

The second annual dinner of the N.E.S.C.O.E. Association was held on February 23rd at the Waldorf Hotel, W.C. Like its predecessor it was a very happy informal reunion of former colleagues in the North-East Coast Company's undertaking. Lt.-Col. W. McLellan (the president) was in the chair. Mr. R. P. Sloan (chairman, North-Eastern Electric Supply Co.) has consented to be president for the coming year, and the present committee, consisting of Mr. H. E. Blackiston, Dr. E. Bowden, and Mr. G. N. Wright, were re-elected, with Mr. W. G. Bass, 506, Bush House, Strand, W.C.2, as hon. secretary. Mr. Bass would be glad to hear from any past members of the staff of the company who desire to be enrolled as members. The subscription to the Association is 2s. 6d. per annum.

The I.E.E. Students' Ball

The second annual ball of the I.E.E. London Students' Section was held on February 21st at the Victoria Halls, Southampton Row, W.C. One can only record once more that the organising ability of Mr. G. S. Smith and his colleagues again gave pleasure not only to the younger members of our profession and their friends but also quite obviously to several of the older ones who were privileged to take part in the function. Mr. J. H. Marsh acted as M.C.

The Faraday House Dance

The annual dance of the Faraday House Old Students' Association and Rugby Club was held on February 24th at the Russell Hotel, W.C. The hon. secretary of the Association, the Rev. L. Van Vestraut, once more acted as M.C., and again received the reward of his work in a most successful function that was thoroughly enjoyed by some 150 members and guests. The principal of Faraday House, Dr. Alexander Russell, was also present.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following:—

ROGER or RODGER vitalator.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir Holberry Mensforth has been elected a director of the Greater London and Counties Trust, Ltd.

Sir Robert A. Hadfield was elected president of the Engineering Golfing Society at the annual meeting held in London on February 23rd.

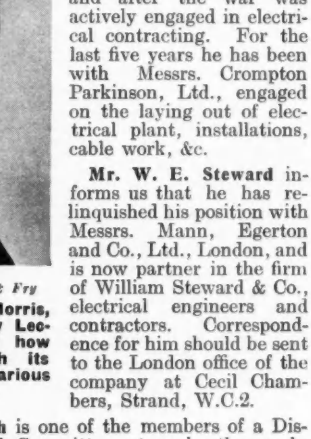
[*Elliott & Fry*

Prof. J. T. MacGregor-Morris, who is giving the Faraday Lecture on "Lightning—and how the Engineer deals with its Effects" before the various Centres of the I.E.E.

Mr. Leslie A. Booth has joined the staff of Messrs. Johnson & Phillips, Ltd., as manager of their London branch, Columbia House, Aldwych, W.C.2. He started his career with the General Electric Co., and after the war was actively engaged in electrical contracting. For the last five years he has been with Messrs. Crompton Parkinson, Ltd., engaged on the laying out of electrical plant, installations, cable work, &c.

Mr. W. E. Steward informs us that he has relinquished his position with Messrs. Mann, Egerton and Co., Ltd., London, and is now partner in the firm of William Steward & Co., electrical engineers and contractors. Correspondence for him should be sent to the London office of the company at Cecil Chambers, Strand, W.C.2.

Maj.-Gen. Sir Philip Nash is one of the members of a Distributors' and Shippers' Sub-Committee set up by the newly inaugurated Coastal Trade Development Council. Sir Philip Nash has been in close touch with national transport problems for many years and was Inspector - General of Transportation on the Western Front in 1918, and subsequently Director-General of Traffic under the Ministry of Transport. Sir Philip is a vice-president of the B.E.A.M.A., chairman of Messrs. W. T. Glover & Co., Ltd., and is also prominently associated with the cement industry.



[*Lafayette*

Mr. Stanley Clegg, M.I.E.E., city electrical engineer to Lincoln Corporation, who has announced his intention of retiring in the near future

Mr. W. H. Fowler, the radiologist, was received by the King at Buckingham Palace on February 28th, and was invested with the insignia of a Commander of the Royal Victorian Order. Mr. Fowler is well known for his research work in X-rays, and as the result of his investigations has suffered the loss of his right arm.

Mr. G. W. Maxfield, A.M.I.E.E., has recently been appointed control engineer for the South-West England and South Wales Area of the Central Electricity Board. After leaving Burnley Grammar School, Mr. Maxfield served in the Burnley Electricity Department as an apprentice. Afterwards he had junior positions at Dundee and Blackburn, and later joined the Western Electric Co. He was at Swindon and Carlisle before taking up his present position as charge engineer at Bradford electricity works. During the war he served in the Navy.

[*Vandyck*

Mr. P. J. Pybus

[*Press Portrait Bureau*

The Hon. Oliver Stanley

The Duchess of York with Miss Anna Holm at the Electrical Housecraft School. **(See page 325)**

Mr. S. Duckworth, A.M.I.E.E., who has been with the Carlisle Corporation Electricity Department for a number of years, was recently presented with gifts from the staff and employés on leaving to take up an appointment with the Croydon Corporation Electricity Department. The presentation was made by Mr. H. P. Baynham, the deputy electrical engineer.

Mr. Reginald Milburn, who has been electrical engineer to the west group of collieries belonging to the Lambton, Hetton and Joicey Collieries, Co. Durham, has been appointed engineer in succession to Mr. F. Short, who recently retired from that position.

Mr. P. J. Pybus, C.B.E., M.P., has resigned the office of Minister of Transport which he accepted under the National Government at the invitation of the Prime Minister. At that time Mr. Pybus indicated that he did not desire to remain exclusively in politics, but that at some date least inconvenient to the Government he wished to return to business, in which he had been engaged all his life. He has chosen the passing of the third reading of the London Passenger Transport Bill in the House of Commons as the fitting time for his retirement. His Majesty has accepted Mr. Pybus's resignation. He has been succeeded by **The Hon. Oliver Stanley,** M.C., M.P., Parliamentary Under-Secretary for Home Affairs, who is the younger son of Lord Derby. It will be remembered that when he was invited to become Minister of Transport Mr. Pybus was connected with the boards of assurance, cement and other companies, and was a director of *The Times*. He had also been prominently identified with the English Electric Co., Ltd. He attended various electrical functions as Minister of Transport. He is understood to be resuming his business matters but exactly what particular interests he will be connected with has not yet been announced.

Obituary

Mr. A. R. Powell.—We regret to record the death of Mr. Albert R. Powell, chief engineer of Cryselco, Ltd., which occurred at his residence, Kempston, Bedford, on February 28th. Mr. Powell had been with the company since 1900. He gave valuable service to the Electric Lamp Manufacturers' Association, as a member of the Works Committee, and at the time of his death was chairman of the E.L.M.A. Lighting Service Bureau. He took particular interest in scientific lighting, and lectured on this subject to the students of Bedford School, and also at Cambridge University. Mr. Powell had been an associate member of the Institution of Electrical Engineers since 1910, and was a prominent Mason.

Mr. F. C. Crittenden.—The death has occurred at his residence at Southend-on-Sea of Mr. Frederick Charles Crittenden, who was for nearly thirty-five years sales manager to the Silvertown Company, at the age of 62.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrieal Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Brynland Electrical & Radio Co., Ltd.—Private company. Registered February 8th. Capital, £200 in £1 shares (100 7 per cent. cumulative preference and 100 ordinary). Objects: To acquire the business of a dealer in electrical and wireless goods hitherto carried on by Alma Gollop at 174a, Brynland Avenue, Bristol. The directors are: Alma Gollop and H. F. Gollop, 38, Cricklade Road, Bishopston, Bristol, and Walter Gollop, 25, Bath Road, Totterdown, Bristol. Solicitors: Meade, King & Co., 22-4, Orchard Street, Bristol.

Aeradio, Ltd.—Private company. Registered February 13th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers, dealers in, factors, importers and exporters of and agents for sale (whether on terms of hire purchase or otherwise) of reproducing instruments, wireless and television apparatus and appliances, &c. The subscribers are: Joe Joseph, 12, Cutler Street, E.C.; and Jack Levy, 56, Park Avenue North, Hornsey, N. Joe Joseph is the first director. Registered office: 12, Cutler Street, Bishopsgate, E.C.2.

Lamplugh Radio, Ltd.—Private company. Registered February 11th. Capital, £400 in five founders' shares of £10 and 1,400 ordinary shares of 5s. each. Objects: To acquire the business of a wireless and radio manufacturer and dealer carried on by Wallace F. Winkles, trading as "Lamplugh Radio Products," at 177, Foleshill Road, Coventry. The directors are: Richard L. Alkin, Corley, near Coventry, and four others. Secretary: Wallace F. Winkles. Registered office: 177, Foleshill Road, Coventry.

Hartley Turner Radio, Ltd.—Private company. Registered January 31st. Capital, £500 in 10s. shares. Objects: To acquire the business of wireless research and the making of loud speakers and all kinds of radio and other electrical apparatus and accessories carried on by H. A. Hartley at Isleworth. The directors are: H. A. Hartley, 56, Eversley Crescent, Isleworth, Middx.; and H. J. Moreton, address not stated. Secretary: Mrs. Ethel M. Ravenscroft. Solicitor: Ernest S. Rudram, 11, New Square, Lincoln's Inn, W.C.

Sun Radio, Ltd.—Private company. Registered February 1st. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and importers of and dealers in radio, telephone, telegraph and television sets, gramophones, &c. The permanent directors are: Ernest R. Bell, 210, Kentish Town Road, N.W.5; and Albert E. Wilson, 143, Regent's Park Road, N.W.1.

Dobrulux, Ltd.—Private company. Registered February 23rd. Capital, £1,250 in 1s. shares. Objects: To acquire patents in respect of "Dobrulux" lamps, and to carry on the business of manufacturers of advertising and other signs, lamps, radiators, fans, boilers, furnaces, generators, dynamos, &c. The directors are: Thos. H. Robinson, 4, Arlington Street, Piccadilly, W., and four others. Secretary: B. E. Chanell. Registered office: 9, King's Bench Walk, Temple, E.C.4.

Modern Power Control, Ltd.—Private company. Registered February 24th, with a nominal capital of £1,000 in £1 shares. Objects: To carry on the business of contractors for electrical and mechanical engineers and contractors for power and lighting installations, and in particular installations for the printing, newspaper and paper-making trades, &c. The first directors are: Richard Brown, 40, Camberwell Grove, S.E.5, and Edward Jenner, 29, Mill Green Road, Welwyn Garden City. Registered office: 102-105, Shoe Lane, E.C.

Wealdstone Radio House, Ltd.—Private company. Registered February 27th. Capital, £500 in £1 shares. Objects: To carry on business as manufacturers, agents and distributors of electrical accumulators, mechanical and radio apparatus, &c. The subscribers are: J. Thorburn, jun., and Jessie M. S. Loudoun, of 109, West George Street, Glasgow. J. Thorburn, jun., is the first director. Registered office: 7, Bridge Approach, High Street, Wealdstone, Middlesex.

A. H. Silcocks & Son, Ltd.—Private company. Registered February 27th. Capital, £3,000 in £1 shares. Objects: To acquire the business now carried on as "A. H. Silcocks & Son," and to carry on the business of wholesale and retail dealers in radio apparatus, gramophones, &c. The permanent directors are: A. H. Silcocks, 43, Mawneys Road, Romford, and two others. Registered office: 56, High Street, Romford, Essex.

Radio Interference Elimination, Ltd.—Private company. Registered February 25th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of and dealers in radio sets, &c. The subscribers are: Chas. Stafford, 953, Finchley Road, Golders Green, N.W.11; and Donald Forrester, 26, Roe Green, N.W.9. Registered office: Dorland House, 14, Regent Street, S.W.1.

Returns of Electrical Companies

Golden Arrow Radio, Ltd.—Capital, £1,000 in £1 shares. Return dated January 11th, 1933. 120 shares taken up. £120 paid. Mortgage and charges, nil.

Almeida Accumulators, Ltd.—J. Kilpatrick, 5, London Wall Buildings, E.C.2, was appointed receiver on February 8th, 1933, under powers contained in debenture dated June 8th, 1932.

Botolph Radio, Ltd.—The nominal capital has been increased by the addition of £4,500 beyond the registered capital of £500. The additional capital is divided into 4,000 6 per cent. preference and 500 ordinary shares of £1 each.

Electrical Manufacturing & Plating Co., Ltd.—Capital, £300 in £1 shares. Return dated December 31st, 1932. All shares taken up. £300 considered as paid. Mortgages and charges, nil.

Watliff Co., Ltd.—Capital, £7,000 in 4,000 7½ per cent. cumulative preference and 3,000 ordinary shares of £1. Return dated October 4th, 1932. 500 preference and 3,000 ordinary shares taken up. £3,380 paid. £120 considered as paid. Mortgages and charges, nil. Return of allotments, made up to January 23rd, 1933, shows a further 600 preference shares allotted, payable in cash and fully called up.

Octron, Ltd.—Capital, £3,000 in 2,850 preference shares of £1, and 3,000 ordinary shares of 1s. Return dated December 15th, 1932. All shares taken up. £3,000 paid. Mortgages and charges, £2,500.

M. Coquantin & Co., Ltd.—Capital, £12,000 in £1 shares. Return dated January 3rd, 1933. 8,800 shares taken up. £8,800 paid. Mortgages and charges, nil.

Impex Electrical, Ltd.—The nominal capital has been increased by the addition of £12,000 in £1 shares beyond the registered capital of £2,000.

Rose & Partridge, Ltd.—Two notices of the appointment of Archibald F. C. Boyes, 4, King's Bench Walk, Temple, E.C., as receiver and manager on February 6th under powers contained in debentures dated August 26th, 1931, September 1st and September 22nd, and November 11th, 1932.

Wireless Services, Ltd.—Issues on December 19th, 1932, of £400; on January 1st, 1933, of £100, and on January 12th, 1933, of £100 debentures, parts of a series already registered.

H. E. Steel, Ltd.—Satisfaction in full on January 31st, 1933, of mortgage dated June 24th, 1922, and registered July 3rd, 1922. (According to the register of mortgages, the mortgage registered July 3rd, 1922, originally secured £1,000.)

"M.P.A." Wireless (1930), Ltd.—E. M. Parker, 161, Victoria Street, S.W.1, was appointed receiver and manager on February 2nd, under powers contained in debentures dated June 13th, 1930.

Hardman & Co., Ltd.—Capital, £500 in £1 shares. Return dated June 11th, filed November 12th, 1932. 480 shares taken up. £480 paid. Mortgages and charges, nil.

Berkeley Electrical Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated January 2nd, 1933. 9,000 shares taken up. £9,000 paid. Mortgages and charges, nil.

A. L. Turner, Ltd.—Issue on February 8th, 1933, of £75 debentures, part of a series already registered.

Hibernian Gas & Electric Investments Co., Ltd.—Capital, £500 in £1 shares. Return dated December 20th, 1932. 2 shares taken up. £2 paid. Mortgages and charges, nil.

Whiteley Electrical Radio Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 6th, 1933. 350 shares taken up. £350 paid. Mortgages and charges, nil.

Three Spires Electric, Ltd.—Capital, £500 in £1 shares. Return dated July 23rd, 1932. Eight shares taken up. £8 paid. Mortgages and charges: £700.

Beeches Radio & Electrical Co., Ltd.—A. M. Smith, 19, Stafford Road, Waddon, was appointed receiver and manager on January 30th, under powers contained in debenture dated November 17th, 1931.

Lesco Trading Co., Ltd.—Debenture dated February 1st, to secure £300, charged on the company's property, present and future, including uncalled capital. Holders: P. M. Sebastyen and H. Weinberger, both of 47, Cleveland Mansions, Maida Vale, W.9.

Manuus Manufacturing Co., Ltd.—The nominal capital has been increased by the addition of £3,000 beyond the registered capital of £2,000. The additional capital is divided into 3,000 6 per cent. cumulative preference shares of £1 each.

Kniveton Cable Works, Ltd.—The nominal capital has been increased by the addition of £2,000 beyond the registered capital of £5,000. The additional capital is divided into 1,500 7 per cent. non-cumulative participating preference and 500 ordinary shares of £1 each.

Belshaw & Co., Ltd.—Capital, £3,000 in £1 shares (2,000 preference and 1,000 ordinary). Return dated October 14th, 1932. All shares taken up. £500 paid. £2,500 considered as paid. Mortgages and charges, £3,500 debentures.

Smithfield Markets Electric Supply Co., Ltd.—Satisfaction in full on January 12th, 1932, of debenture stock secured by trust deed dated February 1st, 1898, and registered September 25th, 1908, securing £50,000.

Siemens Bros. & Co., Ltd.—Satisfaction to the extent of £39,700 on January 2nd, 1933, of debenture stock authorised by resolution dated January 15th, 1918, and secured by trust deed of that date, and registered January 21st, 1918.

Western Electricity Supply Co., Ltd.—Capital, £350,000 in 100,000 6 per cent. cumulative preference and 250,000 ordinary shares of £1. Return dated November 15th, 1932. All shares taken up. £350,000 paid. Mortgages and charges, nil.

Cetex, Ltd.—The nominal capital has been increased by the addition of £10,000 beyond the registered capital of £1,000. The additional capital is divided into 10,000 5 per cent. participating non-cumulative preference shares of £1 each.

Leicester Electrical Engineering Co., Ltd.—Debenture charged on the company's property, including uncalled capital, dated February 7th, to secure all moneys due or to become due from the company to Barclays Bank Ltd.

Siemens-Schuckert (Great Britain), Ltd.—Mortgages dated January 26th, 1933, to secure £5,812 10s. charged on No. 89 Factory, Chase Estate, Park Royal, Acton, N.W. Holders: Allnatt, Ltd., Chase Estate, Park Royal, Acton, N.W.

Yorkshire (Woollen District) Electric Tramways, Ltd.—Satisfaction in full on December 20th, 1932, of debentures authorised February 8th, 1921, and registered March 5th, 1921. (According to the register of mortgages, the debentures registered March 5th, 1921, originally secured £40,000.)

Newcastle & District Electric Lighting Co., Ltd.—Satisfaction in full on January 3rd, 1933, of trust deed dated December 6th, 1922, and registered December 12th, 1922. (According to the register of mortgages, the trust deed registered December 12th, 1922, originally secured £100,000 third debentures.)

G. Lawrance & Co., Ltd.—Debenture dated February 20th, 1933, to secure £1,800, charged on company's undertaking and property, present and future, including uncalled capital. Holder: J. A. Cock, Dunheved, Albany Road, Redruth.

Yorkshire Traction Co., Ltd.—Satisfaction in full on December 19th, 1932, of debentures authorised May 26th, 1921, and registered June 9th, 1921. (According to the register of mortgages, the debentures registered June 9th, 1921, originally secured £29,000.)

Ultra Electric, Ltd.—Capital, £5,000 in £1 shares. Return dated October 11th, 1932. All shares taken up. £3,000 paid. £2,000 considered as paid. Mortgages and charges, nil.

British Pix Co., Ltd.—Satisfaction to the extent of £1,300 on February 1st, 1933, of debenture dated July 5th, 1932, and registered July 7th, 1932. (According to the register of mortages, the debenture registered July 7th, 1932, originally secured £9,000.)

Lotus Radio, Ltd.—W. T. Wood, 3, Lord Street, Liverpool, was appointed receiver on February 16th under powers contained in debenture dated November 16th, 1931.

Phœnix Dynamo Manufacturing Co., Ltd.—Capital, £100 in £1 shares. Return dated January 12th, 1933. 2 shares taken up. £2 paid. Mortgages and charges, nil.

Radiolux, Ltd.—Capital, £1,005 in £1 shares. Return dated January 2nd, 1933. 1,001 shares taken up. £1 paid. £1,000 considered as paid. Mortgages and charges, nil.

Nox Electric Lamp Co., Ltd.—Capital, £15,000 in £1 shares. Return dated October 7th, 1932. 15,000 shares taken up. £14,500 paid. £500 considered as paid. Mortgages and charges, nil.

Erewash Electric Wire Co., Ltd.—Satisfaction to the extent of £1,000 on December 31st, 1932, of debenture authorised December 2nd, 1927, and registered December 9th, 1927.

Goodwin Radio, Ltd.—E. A. Edwards, 47, Green Moor Link, Winchmore Hill, N.21, was appointed receiver and manager on February 18th, under powers contained in debentures dated November 17th, 1931.

Barbados Electric Supply Corporation, Ltd.—The nominal capital has been increased by the addition of £40,000 in £1 ordinary shares beyond the registered capital of £60,000.

City Notes

The Underground Group.—The financial results of these companies were briefly given in our issue of February 17th (p. 257), and the annual meeting was held on February 23rd. Lord Ashfield (chairman), who presided, said that from a business point of view 1932 had been a bad year. The decline in traffic, which first became pronounced at the close of the holiday period of 1931, steadily deepened, and the record of the year was uniformly depressing. Towards the end of the year there were hopeful signs, when the rate of decline was found to be diminishing, and the cumulative losses ceased to mount up at so rapid a pace. The number of passengers carried totalled 2,236,000,000, as compared with 2,283,000,000 in 1931, a decrease of 47,000,000, or 2 per cent. Compared with 1930, the number of passengers carried had fallen by over 3 per cent. The traffic most affected had been the casual or pleasure class. The year 1933 had opened badly, and their traffics had been further depressed. They had directed their attention to economies in expenditure. Negotiations had been brought to a conclusion with the trade unions concerned for the adjustment of wages, which had afforded them an opportunity of securing a reduction of costs. Settlements were only concluded in the autumn of last year, and the present accounts had therefore only benefited to a small extent. The extensions to South Harrow and Arnos Grove were opened during the year, and the results from the latter extension had proved to be as good as their estimates. The extension of the service of the Piccadilly Railway from Hammersmith to South Harrow over the widened track of the District Railway had involved the provision of a greatly increased train service. The London Passenger Transport Bill had now completed all its stages in the House of Commons. He was convinced that the Bill offered the best present solution of London's traffic problems. He hoped that the Bill would speedily complete its passage through Parliament so that steps might be taken without further delay to deal with some of the more pressing problems connected with the provision of a complete and co-ordinated system of passenger transport throughout the London area and its orderly development. At the close of 1919 the capital invested in the undertakings was £48,000,000, and in 1932 it had increased to £80,000,000, of which £26,000,000 had been expended on railway extensions and betterments alone. In 1919 the number of passengers carried was 1,376,000,000, and this number had increased in 1930, before the depression, to 2,311,000,000. Regarding the future, London's population rose by some 60,000 people last year, and the annual increase must ultimately affect the prosperity of undertakings whose business it was to transport that population. He saw no reason for taking a pessimistic view of the future.

The Electrical Distribution of Yorkshire, Ltd., reports a profit for the year ended December 31st last of £150,199, as compared with £116,828 in the preceding year, to which is added £21,788 brought forward, making £171,987. It is proposed to place £35,000 to reserve (against £20,000) and to pay an ordinary dividend at the rate of 9 per cent. per annum, less tax, leaving £28,191 to be carried forward. The report states that the increased demands for electricity have come from all parts of the company's area for a variety of purposes, of which domestic uses continue to be the most important. These uses have been encouraged by the facilities offered by the company for the hire and hire-purchase of electrical apparatus and wiring installations. To continue the unification of supply throughout the company's area, two additional non-statutory undertakings have been purchased, and consumers in Rossington, Doncaster rural district and Upton have been transferred to the company's supply. The company has acquired the whole of the issued capital of the Mid-Cumberland Electricity Co., Ltd. A supply to Cockermouth was commenced in October last, and extensions to other parts of the area are in progress. The whole of the issued capital of the Penrith Electric Supply Co., Ltd., has also been acquired. This undertaking will be worked with that of the Mid-Cumberland Co. The issue of 400,000 6 per cent. cumulative preference shares made in April, 1932, was applied for more than nine times over. After the annual meeting on March 7th (at Leeds) a resolution will be submitting for converting the ordinary and 6 per cent. cumulative preference shares to ordinary and preference stock.

The Metropolitan Railway Co. held its annual meeting on February 23rd, when Sir Clarendon G. Hyde, deputy chairman, who presided in the absence through ill-health of Lord Aberconway, said that in the early part of last year additional capital was raised by the issue of £2,000,000 of 5 per cent. redeemable debenture stock at 97½. The proceeds were required to liquidate the existing debit balance on capital account and to provide the means for carrying out the programme of additions and improvements. The Wembley and Stanmore line was opened on December 10th, the total cost of construction being £500,000. The passenger receipts showed a total decrease of £73,447, and the number of passengers carried declined from 90,000,000 to 82,500,000; this was occasioned by the continuance of trade depression and unemployment, together with motor-omnibus competition. Goods train receipts were also less, the loss being chiefly in respect of the falling-off in the traffic in coal, coke and patent fuel. In the generation of electricity there had been a cash saving in coal of £17,000, but this had been negatived by a charge to revenue of £18,250 for the replacement of boilers. The co-ordination of London transport was for the benefit of London, and the new authority had before it a successful and useful future.

The Llanelly and District Electric Supply Co., Ltd., held its annual meeting on February 27th, when Mr. A. H. Beatty (chairman), who presided, said that he was glad to be able to report moderate progress in all departments. During the year they had carried out various extensions to the electricity supply services, and converted the tramways to trolley-buses. The output of electricity was 24,282,000 kWh, against 24,092,000 kWh in 1931, and there was also a slight increase in the maximum demand. Transmission lines had been extended to provide a bulk supply to Carmarthen and district, and they had also arranged to give a bulk supply to Ammanford. The capital had been increased during the year by £100,000 by the issue of 50,000 preference shares and 50,000 ordinary shares. The industries of South Wales showed signs of improvement, and if this continued they could look forward to satisfactory results next year.

The Northampton Electric Light & Power Co., Ltd.—The accounts of this company were abstracted in our last issue (page 293), and the annual meeting was held on February 27th, when Mr. F. H. Thornton (chairman), who presided, said although the hoped-for improvement in local industries had not eventuated, the company had continued its career of progress and expansion, the sales of electricity had increased by 11.3 per cent., and 3,000 new consumers had been secured. They reduced the tariff for power as from Midsummer last. The 33,000-V line from Northampton to Buckingham was completed early in the year, and a 33,000-V line had been erected from Northampton to Rushden in order to supplement the existing mains and to meet the increasing demand of the Rushden and District Electric Supply Co. for its bulk supply. The extensions had been mainly into rural areas, and twenty new villages had been connected during the year.

The Midland Counties Electric Supply Co., Ltd., reports that the trading profits of the undertakings owned and operated by the company for 1932 amounted to £432,941, as compared with £402,139 in 1931, out of which £128,500 was appropriated for depreciation and reserves. The balance available, including £5,478 brought forward, is £297,126. It is proposed to pay a final dividend on the ordinary shares at the rate of 9 per cent. per annum, making 7 per cent. for the year (same), and to carry forward £5,827. The report states that the various undertakings continued to show satisfactory progress. During the year 200,000 preference shares and £700,000 of 4 per cent. debenture stock were issued. Notice has been given for repayment on March 10th next of the outstanding 5 per cent. debenture stock. Meeting: March 6th.

The London Electric Supply Corporation, Ltd., reports a profit for 1932 of £97,806, to which is added £47,358 brought in and interest on investments (£19,309), making £164,473. The final ordinary dividend is 4 per cent., making 7 per cent. for the year, leaving £61,332 to be carried forward. Pending the settlement of the new standard prices, to operate as from January 1st, 1932, no allocation has been made to the contingencies fund. Neither is it possible to ascertain the amount of the consumers' benefit for 1932. The sales of electricity amounted to 293,480,406 kWh, as compared with 275,782,205 kWh in the preceding year. The report records the death of Brig.-Gen. the Hon. E. Baring, a director, and the election of Lt.-Col. Sir M. J. Wilson to the board to fill the vacancy. Meeting: March 7th.

Baird Television, Ltd.—Meetings of shareholders will be held on March 20th to consider resolutions for increasing the capital from £825,000 to £875,000 by creating 200,000 shares of 5s. each with special rights. The new shares will be known as "A" ordinary shares and will be entitled to half of any divisible profit. The subscription at par has been guaranteed, subject to the resolutions being passed, for a commission of 4 per cent. on the par value. The shares will be offered in the first instance to shareholders in the proportion of one new share for every fifteen preferred ordinary or twenty deferred ordinary.

The Westminster Electric Supply Corporation, Ltd., held its annual meeting on February 28th. Lord Wargrave (chairman), who presided, said that the electricity sold showed an increase over the preceding year's figures of approximately 2½ per cent., but in spite of this the revenue account showed a decrease in the cost of the purchase of electricity amounting to £23,000. The sale of electricity to private consumers showed a decrease of £14,000, and the price per kWh now obtained from this class of consumer was 1.86d. In the Corporation's area of supply there were 61½ miles of streets, 43 miles of which, including most of the important thoroughfares, were electrically lighted by their undertaking. A rental wiring scheme had been introduced in the Pimlico district.

The General Electric Co., Ltd.—Underwriting was completed on February 28th for an issue of £3,500,000 4¼ per cent. first mortgage debenture stock at 105. The object of the issue is to repay the existing 5 per cent. mortgage debenture stock, of which £3,420,140 is outstanding. Existing debenture holders will be offered the right to convert their holdings into an equivalent nominal amount of new stock and to receive a cash payment of 7s. 6d. (less tax) per £100 stock to adjust interest. Debenture stockholders, together with the holders of the preference and ordinary shares, may also apply for such portion of the new stock as is not absorbed by the conversion. The new stock will be redeemed by 1988 by a cumulative sinking fund of ½ per cent. per annum, to operate by annual drawings, from the financial years 1934 to 1975 inclusive at 105 per cent., and afterwards at 100 per cent. or by purchase.

Mather & Platt, Ltd., held their annual meeting on February 28th, Mr. L. E. Mather (chairman) presiding. In presenting the report and accounts (Elec. Rev., February 24th, page 293), the chairman referred to the manufacture of canning machinery on which the company commenced about two years ago, and said they had entered into an agreement with the Food Machinery Corporation of California for the manufacture and sale of canning equipment. They had found a selling company called Food Machinery (M. & P.), Ltd., for the sale of the machinery throughout the British Empire and certain foreign countries. Other developments lay in the directions of fire-extinguishing equipment and a carpet-making machine.

The Charing Cross Electricity Supply Co., Ltd., reports that the net earnings of the West End Undertakings for 1932 were £148,528, as compared with £150,657 in 1931, to which is added other income (£40,838) and £94,251 brought in, making £283,617 (£292,616). After providing for debenture interest, &c., and paying the standard ordinary dividend (7 per cent.), £108,125 is carried forward.

The City Undertakings' accounts show net earnings of £138,077, against £137,491. The standard dividend is paid, and a balance of £5,579 is carried forward.

The National Gas & Oil Engine Co., Ltd., reports a loss for 1932 of £23,865, as compared with a loss of £15,086 in the previous year. A sum of £35,000 is transferred from reserve, and a balance of £1,805 is brought in. From this is deducted the loss for the year, leaving £12,940. It is proposed to pay a dividend at the rate of 5 per cent., less tax, for the year on the preference shares, leaving £940 to be carried forward; the report records the death of Sir Dugald Clerk, chairman of the company.

The Telegraph Construction & Maintenance Co., Ltd., reports a net profit for 1932 of £13,299, as compared with a loss of £195,364 for 1931. To this is added £50,152 brought in, making a total of £63,451, which it is proposed to carry forward. As a result of the reconstruction scheme, the sum of £7 per share has been returned to shareholders, and the resulting £5 shares have been sub-divided into shares of £1 each. The issued capital appears in the balance sheet at the reduced figure of £373,500.

The Pennsylvania Water & Power Co. reports a gross income for 1932 of $5,240,708, as compared with $5,064,070 in the preceding year, and a net profit of $2,122,105 (against $2,056,141). Dividends totalling $3 per share have been paid, leaving a surplus for the year of $832,562. The company has announced a dividend of 75 cents per common share for the quarter ending March 31st.

The Enfield Cable Works, Ltd., reports a profit for the year ended December 31st last of £131,455, as compared with £135,726 in the preceding year, to which is added £2,011 brought in, making £133,466. It is proposed to pay a final ordinary dividend of 15 per cent., making 25 per cent. for the year (same), and to carry forward £2,975. Meeting: March 10th.

The Shawinigan Power Co. reports a gross revenue of $12,635,000 as compared with $13,693,000 in 1931. After making allowance for operating expenses, depreciation, bond interest, &c., the net income was $2,534,500 ($4,150,500). Dividends at the annual rate of $1 a share were paid for the first half of 1932 and an annual rate of 50 cents for the latter half.—*Reuter.*

Dublin United Tramways (1896), Ltd., reports a net revenue for 1932 of £106,541 (against £116,420 in 1931), to which is added interest (£4,880) and £12,756 brought in. The ordinary dividend is maintained at 3 per cent., £21,000 is placed to track renewals, and £10,000 to mortgage and debenture redemption fund, leaving £14,184 to be carried forward.

Companies to be Struck Off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months, unless cause is shown to the contrary:—Brunswick Radio Corporation, Ltd.; Transatlantic Radio, Ltd.; Earlsdon Radio Supplies, Ltd.; Ideal Wireless Co., Ltd.; Zone Wireless Co., Ltd.

Waste Heat & Gas Electrical Generating Stations, Ltd., has declared a final dividend of 5½ per cent., making 8 per cent. for the year (unchanged).

The North-Eastern Electric Supply Co., Ltd., is paying a final ordinary dividend of 3½ per cent., making 6 per cent. for the year (same).

Clarke, Chapman & Co., Ltd., report a net profit for 1932 of £19,916, as compared with £17,288 in the preceding year. As announced in our last issue, a final ordinary dividend of 1¼ per cent. is recommended, making 3½ per cent. for the year (against 5 per cent.), and £11,541 is carried forward.

The St. James' & Pall Mall Electric Light Co., Ltd., held its annual meeting on February 28th, when the Earl of Balfour (chairman), who presided, said that they had purchased over 600,000 more kWh than in 1931 at £10,506 less than the cost in the preceding year. The sales of electricity showed an increase of 1,334,747 kWh and the average return per kWh fell from 1.932d. in 1931 to 1.892d. in 1932.

The Kensington & Knightsbridge Electric Lighting Co., Ltd., reports a net profit for 1932 of £42,899. It is proposed to pay a balance dividend on the ordinary shares at the rate of 8.4d. per share, making the standard dividend for the year (7 per cent.), to appropriate £3,807 to co-partners, and to carry forward £6,255. A total of 31,063,791 kWh was purchased, and the total connections amounted to 47,121 kW.

Telephone Properties, Ltd., has sold privately an issue of £150,000 6 per cent. first mortgage debenture stock at 99. This stock forms part of £300,000 debenture stock which was authorised on December 28th.

The Metropolitan Electric Supply Co., Ltd., reports a net revenue of £504,135 for 1932 (against £490,389). The dividend for the year is maintained at 10 per cent.

The Isle of Thanet Electric Supply Co., Ltd., has recommended a dividend of 4 per cent. on the ordinary shares for 1932 (same).

The Egham & Staines Electricity Co., Ltd., reports a profit for 1932 of £35,882. The ordinary dividend is again 5 per cent. and £1,438 is carried forward.

The Brentford Electric Supply Co., Ltd., reports a profit of £8,765 for 1932. The ordinary dividend is 7 per cent., tax free (against 8 per cent.), and £332 is carried forward.

Stocks and Shares

Tuesday Evening.

THE advent to office of the new President of the United States synchronises with a most unfortunate time for him, because Mr. Roosevelt takes up the reins at a moment when financial conditions in America are undoubtedly black. The banking situation in the United States cries aloud for some action that will save it from the consequence of those various factors which have combined to bring about the extraordinary anomaly of a country which has vast hoards of gold being compelled to refuse, through its banks, payment of deposits to citizens who have left their money with those institutions. In the other hemisphere Germany is threatened with civil war; in the Far East, Japan and China are once more at each other's throats. These matters are germane to an article of this kind, in that they compel, both directly and indirectly, attention to be focused upon British stocks and shares, amongst which those of the best-class industrial undertakings hold a front rank.

Gilt-edged Stocks

London and Home Counties 4½ per cent. debenture stock has risen to 108, bringing it into line with the Central Electricity 4½ per cent. debenture. London Power new 4 per cent. redeemable debenture is on offer at 104¾, giving, at that price, £3 16s. 3d. per cent. on the money. The Perak River Hydro-Electric Power 4 per cent. prior lien debenture stock, of which mention was made here last week as being sold at 98 per cent., is available at 99¾, to yield £4 0s. 6d. per cent. on the money. Midland Counties Electric Supply 4 per cent. debenture stock costs 104; Shropshire, Worcestershire and Staffordshire 5 per cent. debenture stock 112¾. These four issues can be bought free of stamp and fee. There is no stamp duty, also, to pay at present on Edmundson's 4 per cent. debenture stock, although the time is growing very short in which allotment letters are available. The stock is offered at 100¼, giving £3 19s. 6d. per cent. In the Home Railway prior charge list there is very little supply to be obtained of the gilt-edged stocks.

Home Electricity Supply

The London Electricity Supply companies are declaring dividends which in every case to which their Act applies make up the standard to 7 per cent. for the year 1932. No support was lent here, it may be remembered, to the impression that the dividends for last year would be increased over and above the 7 per cent. fixed by Parliament as the standard rate. The optimism which looked for higher distributions is now transferred to the results which may accrue in respect of the current twelve months. The prices of the majority of shares, *e.g.*, Bromptons, Charing Cross, Chelsea, Londons, Westminsters, etc., stand at a common basis of about 33s., giving a return on the money of 4¼ per cent., allowing for inclusion of the dividends now declared. With a 5s. income tax the net yield of 4¼ per cent. comes to £3 3s. 9d., and although proprietors of the shares are satisfied with their investments the yield is hardly sufficient to attract fresh buyers. Accordingly, the market has become extremely quiet, freedom of dealing being handicapped by the comparatively meagre amounts of stock available. The Metropolitan Electric is pay-

ing a final dividend of 7 per cent., making 10 per cent., as usual, on its ordinary shares. The company had at the end of the year a disposable balance of £371,000, compared with £326,000 in the previous twelve months. North Metropolitan ordinary have spurted to 61s. 9d.

Provincial Electrics

Provincial companies' shares continue very firm. The rises of the past two or three weeks are held in every case. Midland Counties Electric maintain their price at 35s. The company's report shows that the board is pursuing an energetic programme in the way of expansion. Electrical Distribution of Yorkshire shares are firm at 43s. 9d. The profits of last year were £33,300 up. The dividend is repeated at 9 per cent. for the year, additional capital ranking this time on account of the new shares that were offered last March. The company proposes to convert the company's shares into stock, which latter will be transferable in units of £1 each.

Home Railway Stocks

The Metropolitan Railway and the Underground Electric Railways of London have held their annual meetings during the past few days, and the speeches of the chairmen at both functions make unusually interesting reading. It is taken for granted that the London Passenger Transport Bill will come into force at an early date. The new Board will not find everything too easy in taking over the organisations. Some reflection of the diminished spending power of the population is seen in a decrease of passengers, carried by the Underground group, of forty-seven million people. The number seems remarkable; more amazing still is the fact that this represents no more than 2 per cent. of the total number of passengers carried. Underground Electric ordinary are easier at 17s. 6d. The company's 5 per cent. first mortgage stock hardened to 112½. Metropolitan consolidated remains at 65, and District at 56½. In the tramway group the feature is a further rise of 3 points in London United Tramway 4 per cent. debenture, following upon a similar improvement last week. London and Suburban Traction preference strengthened to 12s. 6d. There has been a mild inquiry for some of the low-priced shares in this section.

Lissen, Ltd.

The issue of 400,000 8 per cent. preference shares of £1 each in Lissen, Ltd., received too warm a welcome. Too warm, because, as the event proved, part of the rush to secure allotments was on behalf of stags who were equally eager to get out when the letters appeared. Dealings started on Tuesday in this week, the first price mentioned being about 6d. discount. This discount doubled, and then the price rallied a trifle. The shares are now 15s. paid, and are quoted at the moment at 14s. 3d. middle. Ever-Ready shares have fallen to 27s., and Ever-Ready Trusts are lower at 19s. According to report, the radio and wireless trade is feeling the effect of quiet trade conditions. This impression is obliquely borne out by the prices to which the shares of some of the wireless companies have fallen.

Manufacture and Equipment

The Enfield Cable Works is again paying 25 per cent. dividend for the year, although the profits are about £8,500 less than those of the preceding twelve months. The reduction is wiped out, however, by profit on sales of investments, and by additional income from interest. In the year just finished, there was no such charge as the £33,000 included in the 1931 accounts, arising out of a loss incurred through the Australian rate of exchange. The price of the shares remains at 4⅝, showing, at that price, a yield of nearly 5 per cent. on the money. Henleys are ⅛ lower at 6⅞, and Brush ordinary, after its recent spurt, receded to 50. Siemens ordinary are a little better at 27s. Telephone Properties has published particulars of an issue of £150,000 of 6 per cent. first mortgage debenture stock. The company's ordinary shares stand at 21s. 3d., and the preference at 23s. 9d. Telephone Rentals, which are 5s. shares, are quoted at 5s. 9d.

In the weakness caused by the American financial crisis, a number of shares connected with Amsterdam and with Brussels have given way. Amongst these the shares of Philips' Lamps were particularly heavy, dropping to 22s. 6d.

Dollar Stocks

American Telephone & Telegraph stock at 137½ is 10 points down. International Telephone & Telegraph has gone back to 8. A fall of 7 in Consolidated Gas & Electric of Baltimore lowered the price to 78. Shawinigan Water & Power shares are quoted ½ lower at 12½. The weakness has extended to Mexicans. Mexico Tramway fives are 2 points down, and Mexican Light & Power first bonds show a drop of 3. To what lengths the financial crisis in America is likely to extend nobody is attempting to guess. The new President comes into office on Saturday in this week, and, according to report, one of his first acts is likely to be the proclamation of a general moratorium throughout the United States. Canada is closely affected by the concerns of her Southern neighbour, and those who are in touch with financial conditions in the Dominion speak of these as being the reverse of cheerful at the present time. On the other hand, as soon as affairs in the United States take a turn for the better, those in Canada will automatically follow suit.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1930.	1931.	Price, Feb. 28.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	72/6	—	4 2 8
Brompton Ordinary	1	8½	8½	33/6	—	4 3 7
Central Electricity 4½% Deb.	Stock	4½	4½	108	—	4 3 4
Charing Cross Ordinary	1	8¼	8¼	33/6	—	4 3 7
Chelsea	1	8⅛	8⅛	33/–	—	4 4 10
City of London	1	10	10	34/6	—	4 1 2
Clyde Valley	1	8	7	35/–	—	4 0 0
County of London	1	11	10½	53/3	—	4 0 2
Edmundsons' 7% Pref.	1	7	7	29/6	—	4 15 0
Elec. Dis. Yorkshire	1	9	9	43/9	—	4 2 2
Elec. Supply Corporation	1	11	11	66/3	+⅛	3 6 8
Kensington Ordinary	1	8	8	33/6	—	4 3 7
Lancs. Light and Power	1	6½	7	33/9	—	4 3 2
London & Home Counties 4½% Deb.	Stock	4½	4½	108	+1	4 3 4
London Electric	1	9	9	33/–	—	4 4 10
Metropolitan	1	10	10	50/–	—	4 0 0
Midland Counties	1	7	7	35/–	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 6
North Eastern Electric Ordinary	1	6	6	29/6	—	4 1 4
Do. 7% Pref.	1	7	7	32/–	—	4 7 6
Northampton	1	10	10	52/6	—	3 16 0
Notting Hill 6% Pref.	10	6	6	12¾	—	4 14 0
North Met. Elec. 6% Pref.	1	6	6	29/6	—	4 1 4
St. James' and Pall Mall	1	8	8	33/–	—	4 4 0
Scottish Power	1	8	8	35/9	—	4 9 5
South London	1	8½	8½	33/–	—	4 4 10
Urban Ordinary	1	7	7	34/6	—	4 1 2
Westminster Ordinary	1	8¼	8¼	33/–	—	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 2
Yorkshire Elec.	1	8	8	43/9	+6d.	3 13 2
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	84½	—1	4 14 7
Metropolitan	„	3½	2½	65	—	3 17 0
Do. District	„	5	4½	56½	—	5 6 2
Underground Electric	1	8	7	17/6	—	5 2 10
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	137½	—10	6 10 10
Anglo-Am. Tel. Pref.	Stock	6	6	106	—	5 13 0
Do. Pref.	„	1½	1½	25	—	6 0 0
Cables & Wireless 5½% Pref.	„	5½	2¾	82½	+1	3 7 6
Do. A 7½% Ord.	„	—	Nil	27½	+¼	—
Do. B Ord.	„	—	Nil	11	—	—
Globe Tel. and T. Ord.	10	8½	Nil	12	+½	—
Do. do. Pref.	10	6	6	11½	—	5 1 2
Great Northern Tel.	10	20	20	27½	—	7 5 6
Marconi-Marine	1	15	10	33/9	—	5 18 6
Oriental Telephone Ord.	1	12	12	3	—	*4 0 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	—	—	1/9	—	—
Do. do. 2nd Pref.	5	—	—	1/9	—	—
Do. do. 5% Deb.	Stock	—	—	6	—	—
British Electric Traction Def. Ord.	„	5	5	235	—	—
Do. do. Pref. Ord.	„	8	8	136	—	5 17 8
Brazil Traction	100	—	—	9½	—	—
Brit. Columbia Elec. Rly. Pfd.	Stock	5	5	102½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	12/6	+6d.	—
London United Tram Deb.	Stock	4	4	73½	+3	5 8 10
Mexico Trams, 5% Bonds	—	5	5	45½	—2	10 19 10
Mexican Light Common	100	Nil	Nil	7½	+2	—
Do. 7% Pref.	100	7	7	15	—	—
Do. 1st Bonds	—	5	5	74½	—3	6 14 3
Victoria Falls Ord.	1	15	15	74⅛	+⅛	3 14 10
Yorkshire (West Riding)	1	Nil	Nil	5/6	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	4	17/6	—	4 11 5
Do. Pref.	1	8	8	31/3	—9d.	5 0 0
Babcock & Wilcox	1	14	14	37/6	—	—
British Aluminium Ord.	1	10	5	25/–	—	4 0 0
British Insulated Ord.	1	15	15	67/6	—	4 8 4
Brush Ord.	Stock	5	Nil	50	—5	—
Callender's	1	15	15	3	—	5 0 0
Do. 6½% Pref.	1	6½	6½	28/3	—	4 12 0
Crompton Parkinson Ord.	5/–	30	24	22/6	—	5 0 0
Do. 8% Pref.	1	8	8	30/–	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	12/–	—	—
Enfield Cable Ord.	1	25	25	4⅝	—	5 8 1
English Electric	1	Nil	Nil	12/6	—	—
Do. do. Pref.	1	Nil	Nil	15/6	—6d.	—
Ever Ready	5/–	35	35	27/–	—3/–	6 9 8
Ferranti Pref.	1	7	7	24/–	—	5 18 0
G.E.C. Pref.	1	6½	6½	29/6	—	4 8 2
Do. Ord.	1	10	8	42/–	—	3 16 2
Henley's	1	30	30	6⅞	—⅛	4 17 1
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	2/6	—	—
Johnson & Phillips	1	10	5	1	—	5 0 0
Siemens Ord.	1	7½	7½	27/–	+9d.	5 11 1
Telegraph Construction	£1	Nil	Nil	16/3	—	—

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1931

12523. "Electromagnetic operating mechanism." Dubilier Condenser Co. (1925), Ltd. May 2nd, 1930. (387336.)
15446. "Electro-glow discharge tube." L. H. Roos. May 26th, 1930. (387337.)
21407. "Vapour-electric discharge devices." British Thomson-Houston Co., Ltd. Aug. 1st, 1930. (387328.)
21461. "Electric couplings." W. E. Barber. July 28th, 1931. (387342.)
21864. "Power plants." G. A. Juhlin, E. M. Johnson and Associated Electrical Industries, Ltd. July 31st, 1931. (387368.)
21912. "Electric power converting apparatus." British Thomson-Houston Co., Ltd. Aug. 8th, 1930. (387369.)
21961. "Eddy-current brake for applying drag to the bobbins of spinning and like textile frames." J. F. Low & Co., Ltd., and J. Hargrove. Aug. 1st, 1931. (387345.)
22058. "Semi-automatic telephone systems." Standard Telephones & Cables, Ltd., and J. H. E. Baker. Aug. 4th, 1931. (387373.)
22083. "Electric signalling systems." Associated Telephone and Telegraph Co. Aug. 18th, 1930. (387375.)
22095. "Electrical musical instruments." General Electric Co., Ltd., and G. T. Winch. Aug. 4th, 1931. (387376.)
22133. "Submarine cables." Electrical Research Products Inc., and J. J. Gilbert. Aug. 4th, 1931. (387379.)
22190. "Multi-phase metal-clad electric switchgear." A. Reyrolle & Co., Ltd., and J. Mirrey. Aug. 5th, 1931. (387384.)
22233. "Manufacture of multi-core electric cables." Krupp Grusonwerke Akt.-Ges. Nov. 13th, 1930. (387387.)
22286. "Telephone or like signalling systems." Electrical Research Products, Inc. Aug. 8th, 1930. (Addition to 26759/30.) (387391.)
24456. "Apparatus for operating electric motor controllers." General Electric Co., Ltd., and A. L. G. Lindley. Aug. 31st, 1931. (387408.)
25276. "Multi-stage thermionic amplifier tube." M. Von Ardenne. Sept. 9th, 1930. (387413.)
27931. "Production of welders' electrodes." W. O. Larmuth and Larmuth & Bulmer, Ltd. Oct. 8th, 1931. (387424.)
31047. "Process of manufacture of thin solid films, insulating and having a high dielectric strength." A. A. Samuel. Nov. 8th, 1930. (387437.)
31768. "Lamps for floodlighting, advertising, and like purposes." H. O. Smith. Nov. 18th, 1930. (387443.)
32680. "Electrostatic dust precipitation." Sturtevant Engineering Co., Ltd., and H. W. Wagner. Nov. 25th, 1931. (387452.)
33028. "Electrical condensers and methods of constructing them." Plessey Co., Ltd., W. O. Heyne, and P. J. Packman. Nov. 28th, 1931. (387455.)
33693. "Electric telegraphy." Electrical Research Products, Inc. Dec. 12th, 1930. (387463.)
34607. "Automatic telephone systems." Siemens Bros. and Co., Ltd., and C. L. Peters. Dec. 14th, 1931. (387471.)
34753. "Electric transformers." British Thomson-Houston Co., Ltd., and F. P. Whitaker. Dec. 15th, 1931. (387472.)
35341. "Alternating current systems." A. J. King and Associated Electrical Industries, Ltd. Dec. 21st, 1931. (387476.)
36069. "Rotary or motor-driven rheostats." Curtis Manufacturing Co., Ltd., and F. C. Curtis. Dec. 31st, 1931. (387484.)

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1583/4. "Electrically driven machine tools." Sir A. Herbert, A. H. Lloyd, F. J. O. Coxon and C. H. Jinman. Jan. 19th, 1932. (387494/5.)
2848. "Flexible electric cables." C. J. Beaver, N. Dixon and W. T. Glover and Co., Ltd. Jan. 30th, 1932. (387505.)
3695. "Electric mercury switches for motor car protection." W. F. Tyler. Feb. 8th, 1932. (387509.)
5707. "Process of improving the electrical conductivity of copper." Metallges Akt.-Ges. Feb. 27th, 1931. (387516.)
5893. "Apparatus for electric-therapy and for determining the chronaxi of a muscle." Dr. G. Oppenheim. Feb. 28th, 1931. (387518.)
7422. "Electric cable grips." W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. March 12th, 1932. (387524.)
8932. "Television method." M. Von Ardenne. March 27th, 1931. (387536.)
9748. "Electromagnetic recording of sound oscillations." C. Lindstrom Akt.-Ges. April 8th, 1931. (387540.)
10595. "Television transmission systems." Fernseh Akt.-Ges. April 17th, 1931. (387543.)
10728. "Connecting arrangement for electrostatic telephone instruments." H. Vogt. April 30th, 1931. (387546.)
15985. "Device for the electrical balancing of submarine communication cables." Siemens-Schuckertwerke Akt.-Ges. June 6th, 1932. (Addition to 350868.) (387568.)
16792. "Electric dry cells." Vereinigte Deutsche Metallwerke Akt.-Ges., Zweigniederlassung Suddeutsche Metallindustrie. November 14th, 1931. (387575.)
18133. "Electric battery gas-lighters." K. Braun. June 27th, 1932. (387582.)
18746. "Electrodes for electric furnaces." Det Norske Aktieselskab for Electrokemisk Industrie. July 7th, 1931. (387585.)
19974. "Devices for the television transmission of pictures derived from a cinematographic film." Compagnie pour la Fabrication des Compteurs et Material d'Usines à Gaz. August 28th, 1931. (387592.)
22799. "Time switch for switching on the lights of automobiles." R. M. Johnstone. August 15th, 1932. (387610.)
26107. "Electric machines with laminated masses." P. Ehrmann. May 19th, 1931. (Divided application on 14266/32.) (387622.)
26512. "Electric switches, and the mounting thereof on the cylindrical handles of vacuum or suction cleaners and other appliances." Air-way Electric Appliance Corporation. May 20th, 1931. (Divided application on 21261/31.) (387394.)
26940. "Insulated electric cables." Liverpool Electric Cable Co., Ltd., and T. H. Tweedle. September 28th, 1932. (387626.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from February 22nd:—

Philora. No. 537621. Class 8. Philosophical and scientific instruments and apparatus for useful purposes. No. 537623. Class 18. Engineering, architectural, and building contrivances.—Philips Gloeilampenfabrieken, Eindhoven, Holland. (British representatives: Dicker, Pollak & Mercer, 20-23, Holborn, E.C.1.)

Dobrolux. No. 537842. Class 2. Electrically illuminated advertising signs. No. 536982. Class 13. Electric lamps (ordinary).—Col. W. H. Lewis and O. P. Horlick, 127, High Street, Slough, Bucks.

AvcDapter. No. 538054. All goods in Class 8.—Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, 21, Douglas Street, Westminster, S.W.1.

Lumax. No. 527817. Class 13. Electric lamps (ordinary).—Ceag, Ltd., Queen's Road, Barnsley.

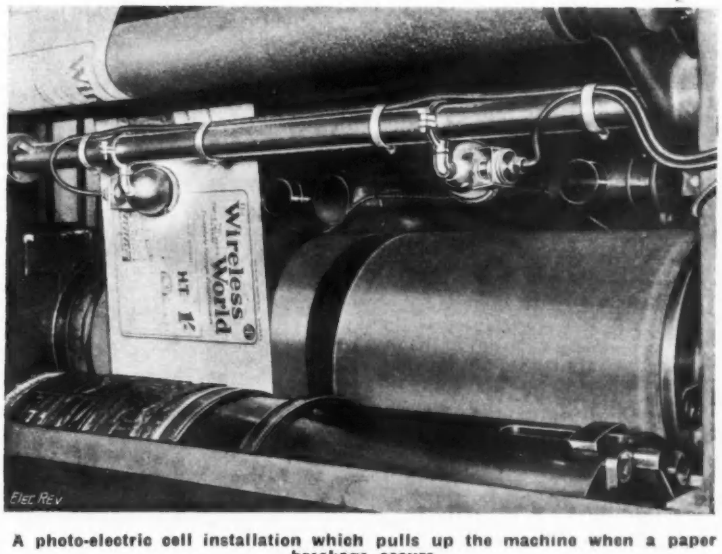
Lyng. No. 538355. Class 13. Electric switches (ordinary), switch-plugs, irons, lighting fittings, kettles, &c.—William Cross & Sons, Ltd., Lyng Foundry, Bond Street, West Bromwich.

The Photo-electric Cell in Printing

IN our issue of July 15th, 1932, we referred to the great field open to the photo-electric cell in its industrial applications. Prominent among these was its use to prevent the considerable loss of time and damage that often follows breakage of paper on rotary printing presses.

An installation has recently been placed in service at the works of the Cornwall Press, Ltd., where the ELECTRICAL REVIEW is printed. In this instance a small lamp illuminates one side of the sheet of paper as it passes through the machine; the photo cell is in a housing on the opposite side of the sheet. Normally the cell is in the dark, as the paper obstructs the passage of light, but as soon as the paper is fractured, light reaches the cell, and the valve relay contacts close bringing into operation mechanism which stops the machine within two seconds. A cell is placed at a point on each length of the web, and the main amplifier with its relay is fitted in a convenient place away from the machine.

Without such control, a breakage may cause the loose web to wind itself round the cylinders, thus damaging the printing plates, as the breakage may not be detected in time by the operators. The accompanying photograph, reproduced by permission of the Editor of *The Wireless World*, shows the arrangement of the installation described, which was made by the Cornwall Press, Ltd., in co-operation with the General Electric Co., Ltd.



A photo-electric cell installation which pulls up the machine when a paper breakage occurs

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Accrington (Lancs).—Alterations and improvements to Prince's Theatre, Edgar Street; J. R. Ashworth, architect, Palace Buildings, Peel Street.

Acton.—Flats, Canada Road and Gunnersbury Lane; library, Oldham Terrace; and extensions, Municipal Offices; borough engineer. Flats, Fairlawn Park Estate; W. Hearn & Chuter, architects. Flats (458), Oldfield Estate; K. W. Matherson and R. O. Sutherland, architects. Factory, Western Avenue; C. J. Fitzpatrick & Co.

Allesley (Coventry).—Houses (40) and shops, Hockley Lane, for H. W. J. Holdham.

Allhallows (Rochester).—Hotel (£11,000), for Charrington and Co., Ltd., Mile End, London, E.; S. J. Funnell, architect.

Ashington (Northumberland).—Houses (66); Council Offices.

Barnes (Surrey).—Flats (47), Grove Road and Terrace Gardens, for E. H. Wale & Co.

Barnstaple.—Block of business premises, High Street, for H. F. Youings.

Betchworth (Surrey).—Estate development, Broome Park; L. A. Dibdin, Mulgrave Road, Sutton.

Bexhill-on-Sea.—Flats, De la Warr Parade; J. E. Manning, architect. Additions, Cooden Beach Hotel and Granville Hotel; E. Bunce, architect.

Billingham-on-Tees.—Houses (66), Cowper Lane Estate; J. McCreton, Ltd., West Terrace, North Ormesby, Middlesbrough.

Birmingham.—Additions to school at the Oratory, Hagley Road, Edgbaston (electrical installations); A. Crush, 37, York Road.

Blaydon-on-Tyne.—Houses (24); T. Mastaglio, surveyor, Council Offices.

Bolton.—Houses, Ivy Road and Clough Road (electric lighting installations); Messrs. Leigh Bros., builders, Bark Street.

Bootle.—R.C. church; Rev. J. Kelly, St. Alexander's Church.

Bournemouth.—Houses (110), Kinson Estate (£27,366); A. Schofield. Store, Wimborne Road; F. W. Woolworth & Co., Ltd.

Brentwood.—Extensions, High Wood Hospital (£7,123); C. Miskin & Sons, Ltd.

Brighton.—Baths (£80,000), for a Bournemouth syndicate; G. W. Jackson, architect, Penrith Road, Bournemouth. Extensions, Whitehawk School (£14,500) for E.C.

Canvey Island.—Estate development (130 acres), Russell Head Farm, for Canvey Estates, Ltd.

Carlisle.—Houses, Raffles Estate (30), and Upperby Estate (30), and two central schools, Swifts; P. Dalton, city engineer, 18, Fisher Street.

Castle Ward (Northumberland).—Sewage works, Stamfordham; J. Jameson Fernlea, surveyor, Ponteland.

Charlton Kings (Glos).—Houses (26), Little Herbert's Road, for Capt. Richardson.

Chelmsford.—Catholic school, London Road; Rev. M. J. Wilson.

Cheshire.—School, Runcorn, for the C.C.; F. A. Browne, architect, The Castle, Chester.

Congleton (Cheshire).—Houses (120), West Heath, for H. E. Rohll, Sandbach Road.

Corbridge (Northumberland).—Extensions, Charlotte Straker Hospital; W. Dixon & Sons, architects, 1, Collingwood Street, Newcastle.

Darlington.—Houses (36), various sites; J. W. Pallister, surveyor, 51, Coniscliffe Road.

Derby.—Senior school, Nottingham Road (£8,000); borough architect.

Devonshire.—Enlargement of Cullompton School (£4,700), for County E.C.

Doncaster.—Church, Intake (£3,000); F. Pearson & Co., builders.

Durham.—Cinema, North Road; Gradon & Sons, builders. North Road Sawmills. School clinics, Billingham-on-Tyne (£2,500) and Blaydon-on-Tyne (£2,500); W. J. Merrett, county surveyor, 43, Old Elvet. School (300 places), Horden, for County E.C.

Edinburgh.—Houses (36), Greenbank Loan; G. M. Campbell, architect, 30, Bath Street, Portobello.

Egham (Surrey).—Factory for A. Mills, Ltd., Runnemede Works.

Ely.—Cinema, Newnham Street; R. Wright, 26, High Street.

Epsom.—Municipal Offices (£30,000); Norris & Co. (Builders), Ltd., 267, High Street, Uxbridge.

Essex.—Junior and infants' schools, Chingford; J. Stuart, county architect, Chelmsford.

Evesham.—Houses (30); R. J. Atkinson, R.D.C. surveyor, 64, Port Street.

Fife.—Church, Buckhaven; J. Black, United Free Church.

Fifeshire.—Reconstruction of St. Margaret's Catholic School, Dunfermline, for the County E.C.

Hampshire.—Junior school, Purbrook (£7,000), for County E.C.

Hartley Wintney (Hants).—Houses (32); A. J. R. Watts, building surveyor.

Hertfordshire.—School, Parkway, Welwyn (£12,858), and enlargement of Parkgate Road School, Watford (£2,410), for County E.C. Extensions, Western House Institution, Ware (£33,965), for Assistance Committee.

Ipswich.—School of arts (£11,000), for E.C.

Irish Free State (Ballina, Co. Mayo).—Houses (108); P. A. Calleary, engineer, Pearse Street.

Jarrow.—Clearance scheme, Ellison Street area; borough engineer.

Kent.—Schools, Orpington, St. Mary Cray, and Green Street Green; director of education, Maidstone.

Kettering (Northants).—Extensions, factory premises, Wellington Street, for Seddons & Arlidge Co., Ltd., Regent Street.

Leeds.—Premises for Yorkshire Penny Bank, Ltd.; W. Nicholson & Son, Ltd., builders, Sheaf Street.

London.—(Bermondsey).—Flats, Redriff Estate (£50,000); B.C. Works Department. (Bethnal Green).—Tenements, Teale Street (£25,388), and extensions, Poor Law Hospital (£5,000); L.C.C. architect. (Eltham).—School (£33,000), with electrical and heating work, Middle Park Estate, for E.C. (Lewisham).—Hospital ward block (£35,973); W. H. Gaze & Sons, Ltd., builders, Kingston-on-Thames. (Mile End).—Laboratory at hospital (£4,175); J. E. Billings & Co., Ltd. Nurses' home, Poor Law Hospital (£12,000); Chas. R. Price. (Rotherhithe).—Branch stores, 173-7, Rotherhithe New Road; Royal Arsenal Co-operative Society, Ltd. (St. John's Wood).—Flats, 10, Abbey Road; F. Rings. (Shoreditch).—Improvements to Hoxton Baths (£3,520); borough engineer. (Stoke Newington).—Flats, Lordship Terrace, and town hall; surveyor, Council Offices, 166-180, Church Street. (Tottenham).—Factory extension, Tavistock Road; Power Flexible Tubing Co., Ltd. Alterations to factory, Vale Road; R. Rosenblatt & Son. (Wood Green).—Houses, Pickings Estate; F. F. Tomlin.

Manchester.—Police headquarters, Jacksons Row (£98,970); city architect.

Middlesbrough.—R.C. church, Marton Road (£7,000); Mr. Spink, Fairfield Road, Bridlington.

Monkseaton (Northumberland).—Church; Messrs. Spears, Ltd., builders, Glasgow.

Newcastle-under-Lyme.—Additions, Orme Boys' Modern School (electrical installations); Hollins & Jones, Lloyds Bank Buildings.

North Riding.—Senior school (400 places), Grangetown; education architect, Northallerton.

Oxford.—Theatre, George Street; W. & T. R. Milburn, architects, London and Sunderland.

Paignton.—Hotel, Broadsands; Staverton Builders, Ltd.

Penrith.—Houses (24); G. A. J. Edmundsen, U.D.C. surveyor.

Portland.—Houses (30); U.D.C. surveyor.

Potter's Bar.—Cinema (£14,800); Leightons (Contractors), Ltd., builders, Lowestoft.

Preston.—Sports stadium, Farringdon Park (£10,000), for White City Sports Stadium (Preston), Ltd.

Rawtenstall.—Houses (50); borough engineer.

Richmond (Surrey).—Flats (116), Upper Richmond Road, for F. Mousley; Meakin, Archer & Co., architects, 73, King William Street, E.C.

Royston (Herts).—Casual wards (£3,735); county surveyor.

Sandbach.—Public offices (£2,260); Birchall Bros., builders, Middlewich.

Sanderstead.—Houses (30), Limpsfield Road; Bridges, Doran & Co.

Sedgley.—Houses (100); U.D.C. surveyor.

Sheffield.—Church of St. Christopher, Bellhouse Road, Lower Shiregreen (electric lighting installations); M. J. Gleeson, Ltd., builders, 822, Chesterfield Road.

Shrewsbury.—Rehousing scheme (100); borough surveyor.

Smethwick.—Houses (208), Warley Estate (£64,000); borough engineer. Hospital extension (£6,252); J. E. Harper & Son, Ltd., Birmingham.

Southend-on-Sea.—Mental hospital extensions, with electrical work (£4,500); borough engineer.

St. Helens (Lancs).—Factory extensions, Lancots Lane, for British Sidac, Ltd.

Stockport.—Re-erection of factory, Ellen Street, Heaton Norris, for B. Barton & Co.

Stockton-on-Tees.—Omnibus shelter and waiting room, Butts Lane, Yarm; J. P. Wakeford, borough engineer. Rebuilding of the Hippodrome Theatre; A. McLeod, Ltd., builders, Bridge Street, Thornaby.

Stoke-on-Trent—Church, Leek; Longden & Venables, architects, 20, Stafford Street, Hanley.

Strouden (Hants).—Hotel for Eldridge, Pope & Co., Ltd., Dorchester.

Sunderland—Houses (22), Carley Hill Estate; W. D. Allison, builder, Whitburn. Catholic school (500 places), Millfield; Rev. J. O'Dwyer. Alterations and improvements to Grand Hotel, Bridge Street; Cowe & Lawson, architects, Central Chambers, Front Street, Chester-le-Street.

Surrey.—Boys' secondary school, Merton, Bushey Mead, for County E.C.; W. W. Finny, secretary, Kingston-on-Thames.

Sutton Coldfield.—Houses (36), Heathlands Road; Excelda Housing Supplies. Catholic church, Lichfield Road; Rev. F. de Captain.

Swanscombe (Kent).—Houses (60), Council Estate; U.D.C. surveyor.

Taunton.—Baths (£3,000); Robert & Willman, architects, Hammett Street.

Teddington.—Houses (38), St. Mary's Estate, for H. & L. Sloggett.

Thornaby-on-Tees.—Houses (100), Grange Farm Estate; H. Kay, surveyor.

Twickenham.—Houses (43), Richmond Bridge Estate; R. A. C. Churchward, architect, 92, Victoria Street, S.W.1.

Tynemouth.—Houses (36); J. L. Beckett, borough surveyor.

Uppingham.—Houses (24); G. Dolphin, R.D.C. surveyor, North Street.

Wallasey.—Estate development, Green Lane; M. Hughes.

Walsall.—Extensions, General Hospital, Bradford Street; Jeffries & Shipley, architects, Kings Court, Bridge Street.

Wealdstone (Middlesex).—Public baths (£9,700); Council's surveyor.

West Worthing.—Baptist church (£3,000); secretary.

Wickford (Essex).—Mental hospital (1,000 patients); surveyor.

Wolverhampton.—Civic centre, with public and market halls; borough engineer. Houses (136); A. M. Griffiths & Son, Ltd., builders.